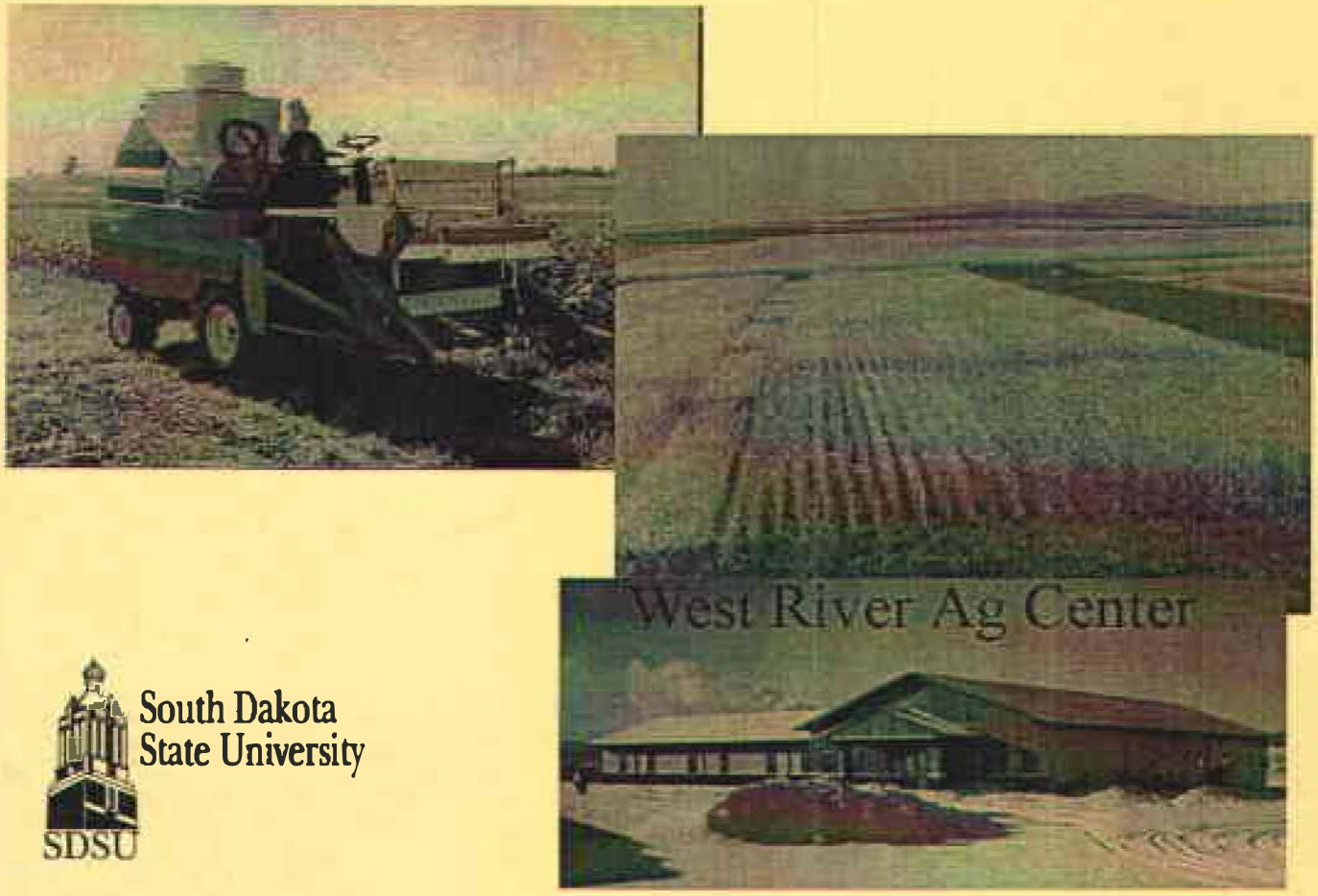
ANNUAL PROGRESS REPORT 1996

SOUTH DAKOTA STATE UNIVERSITY

WEST RIVER AG CENTER

CROPS AND SOILS RESEARCH

PLANT SCIENCE PAMPHLET #88 **FEBRUARY 1997**



South Dakota State University

SDSU

INTRODUCTION

This is an annual progress report of the West River Crops and Soils Research Projects, South Dakota Agricultural Experiment Station. The equipment storage and processing facilities are located approximately one mile southwest of Box Elder, SD at 21 County Road 212. The office facilities are located at 1905 Plaza Boulevard; Rapid City, SD 57702. Telephone (605)394-2236, e-mail: jrickert@silver.sdsmt.edu

The Research Projects serve the western part of South Dakota. They are unique in that all experimental plots are cooperatively located with Farmers, Ranchers, or Crop Improvement Associations, through Extension Agents.

The research is conducted on farmers fields under their conditions. The research tests the adaptability of new crops, varieties and farming methods. This report does not include results of work conducted by projects headquartered from the campus at Brookings, South Dakota.

FIELD PLOT COOPERATORS

Name	Address	County
Gary Nies	Martin 57551	Bennett
Denny Gearson	Martin 57551	Bennett
Dave Reaser	Oelrichs 57763	Fall River
Roger Rosenow	Ralph 57650	Harding
Tim Komes	Sturgis 57785	Meade
Bill Huber	Parmelee 57566	Mellette
Bill Goeringer	Newell 57760	Butte
Crown Partnership	Wall 57790	Pennington
Rodney Renner	Wall 57790	Pennington
Rick Johnson	Wall 57790	Pennington
Jim Madsen	New Underwood 57761	Pennington
Gregg Krebsbach	New Underwood 57761	Pennington
David Finneman	Rapid City 57701	Pennington
Gary Wunder	Bison 57620	Perkins
Dave Vogel	Hayes 57537	Stanley
Sivage Farms	Hayes 57537	Stanley
Leon & Rex Haskins	Hayes 57537	Stanley
Mark Stiegelmeir	Selby 57472	Walworth

This is an annual report, some trials are ongoing and will require additional testing before final conclusions can be made.

250 copies printed at an estimated cost of $3.42 each. Febuary 1997

South Dakota State University, South Dakota Counties, and U.S. Department of Agriculture Cooperating

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ACKNOWLEDGMENTS

The following County Extension Agents assisted in locating cooperators and conducting the research: Bill Keck-Rapid City, Gary Nies-Martin, Ed Bowker-Hot Springs, Ken Nelson-Buffalo, Robert Fanning-Kennebec, Valerie Mitchell-Murdo, Dan Oedekoven-Sturgis, Vincent J. Gunn-Bison, Jim Kanable-Mound City and Paul Weeldreyer-Pierre.

The results reported in this pamphlet were funded under Plant Science Projects SD 00956, Research Substation and SD 00320, Conservation Compliance in Western South Dakota. Additional financial support was received from The South Dakota Crop Improvement Association, The South Dakota Wheat Commission, South Dakota Foundation Seed Stocks Division-SDSU, South Dakota Oilseed Council, Monsanto Agricultural Company, Ciba Crop Protection, Gustafson Corporation, Phosphate & Potash Institute and Wame Chemical Co.

Research was conducted by C.E. Stymiest-Associate Professor, J.R. Rickertsen-Research Associate, B.A. Swan-Senior Ag Research Technician, and in conjunction with F.A. Cholick-Director Ag Experiment Station, D.J. Galenburg-Dept. Head Plant Science, R.G. Hall, R.J. Pollman and J. Ingemansen.

A special thank you is extended to Leon Ellis and John Fortune Jr. for their help during the summer of 1996.

This publication was written and edited by Clair E. Stymiest, John R. Rickertsen and Bruce A. Swan.

WEATHER SUMMARY

The data in the weather summaries presented in the following charts and Tables 1 and 2 were obtained from the National Oceanic and Atmospheric Administration (NOAA) publication, Climatological Data - South Dakota; from Al Bender, State Climatologist at South Dakota State University; and from the South Dakota Crop-Weather Summary published by the South Dakota Statistical Reporting Service-USDA.

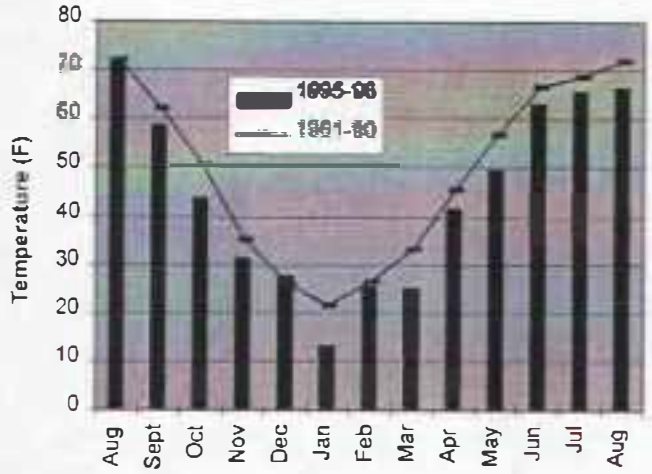
Average August air temperatures were near normal at Martin and 2-3 degrees warmer than normal at the other locations. September was cooler than normal at Martin and Oelrichs and normal elsewhere. October and November were 1-3 degrees colder than normal at central and southern locations and near normal at northern locations. December temperatures were normal to 3 degrees above at all locations. January was very cold with readings 6-8 degrees below normal. February was warmer with temperatures returning to near normal. The cold returned in March with temps 8-10 degrees below the norm. April was 2-3 degrees cooler than normal and the trend continued in May with readings 4-5 degrees below normal. June warmed up with near normal temperatures. July was 1-3 degrees below normal at most locations and August was 1-2 degrees above normal.

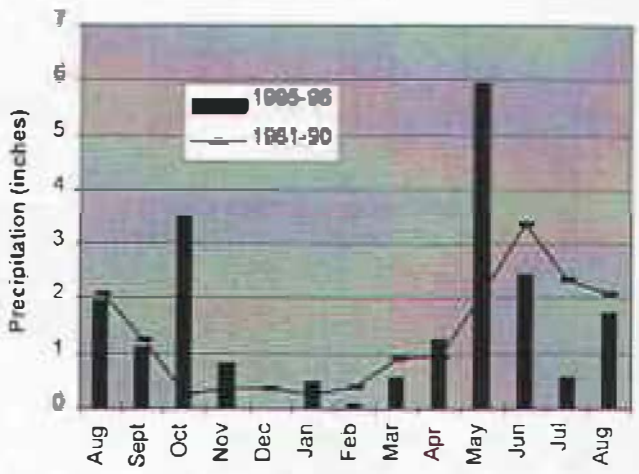
August precipitation was normal in the northwest and at Martin, the other locations were about an inch below the norm. September was near normal at all locations. October was wet with rainfall 2-3 inches above normal. November through April showed near normal amounts at most locations. May was very wet with rain amounts 3-5.5 inches above normal. June and July were drier with measurements 1-2 inches below normal. August was 1 inch below normal at Kirley, Murdo and Ft. Meade; with near normal precipitation elsewhere.

Total useable moisture (Table 2) was adequate at all locations. The August through July season amounts ranged from 8.18 to 13.75 inches. Spring season (April - July) moisture was also adequate ranging from 5.15 inches at Oelrichs to 10.10 inches at Ft. Meade.

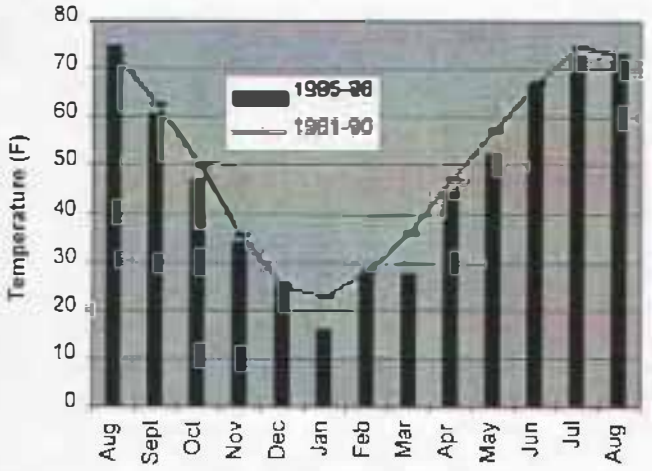
Overall fall was mild with plentiful moisture in October. Winter was fairly normal except for cold conditions in January and March. April and May were cool with lots of rain in May. Summer brought near normal temperatures and below normal precipitation.

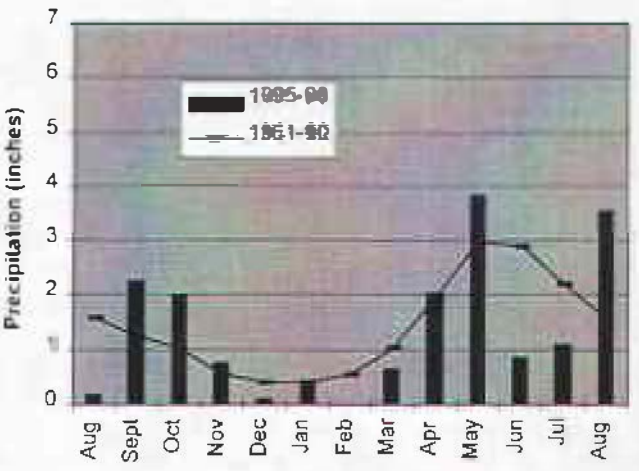
Temperature and Precipitation Charts for Martin (Bennet County Reporting Station).



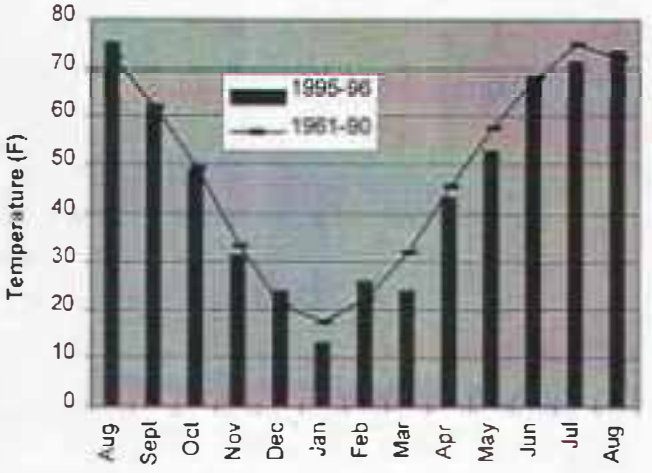


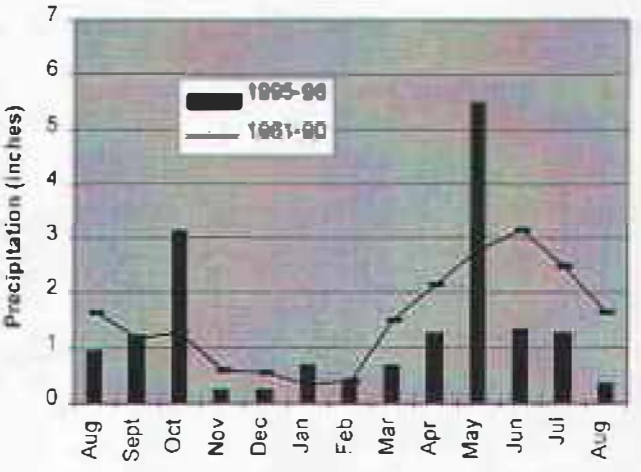
Temperature and Precipitation Charts for Oelrichs (Fall River County Reporting Station).





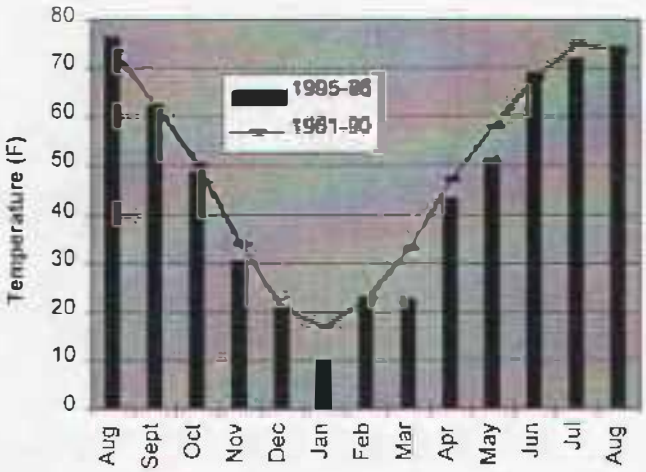
Temperature and Precipitation Charts for Murdo (Jones County Reporting Station).

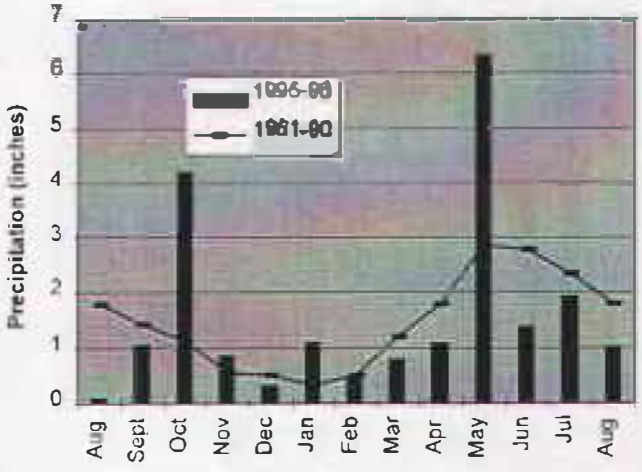




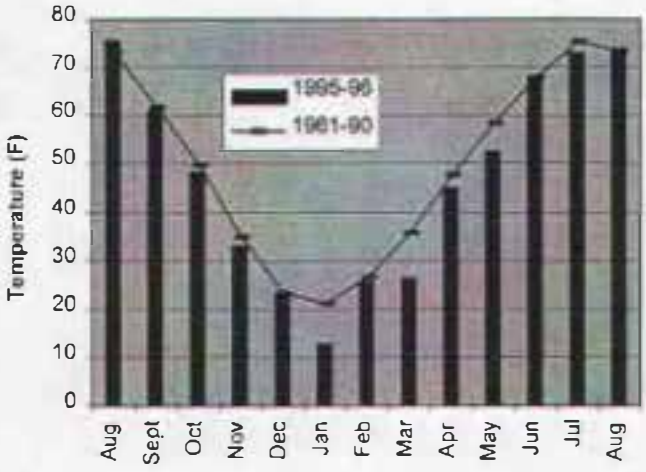
Average temperatures and precipitation obtained from NOAA Climatological Data and from Al Bender, State Climatologist at South Dakota State University. Weather data is collected from the reporting station nearest the experimental sites.

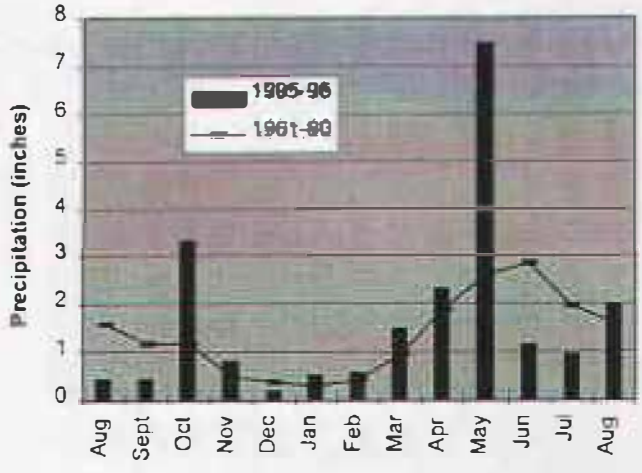
Temperature and Precipitation Charts for Kirley (Haakon County Reporting Station).



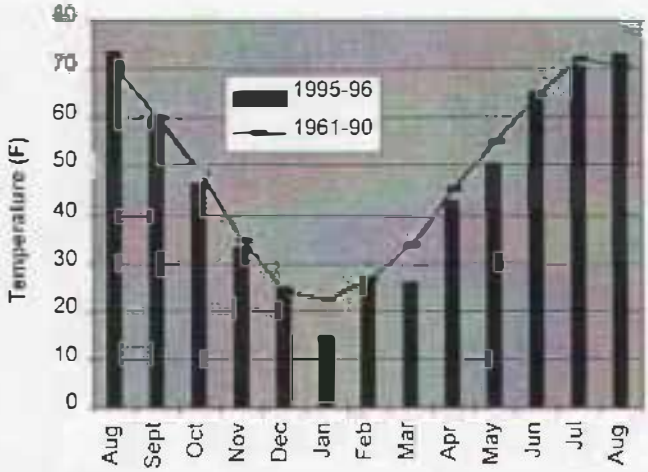


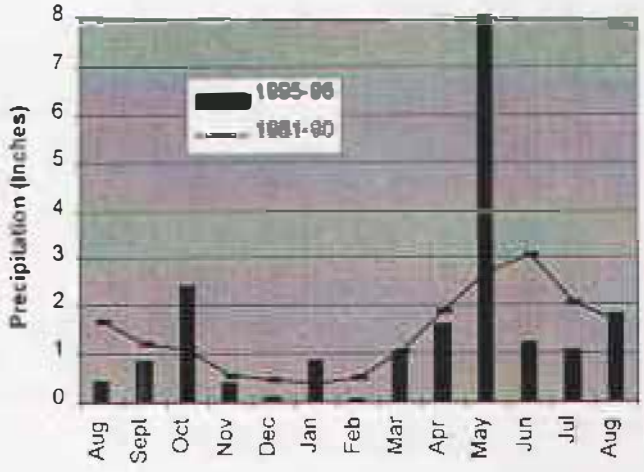
Temperature and Precipitation Charts for Wasta (Pennington County Reporting Station).





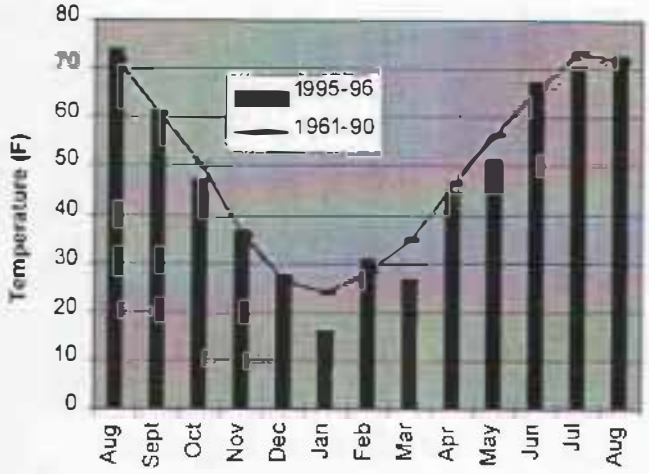
Temperature and Precipitation Charts for Rapid City Airport (Pennington County Reporting Station).

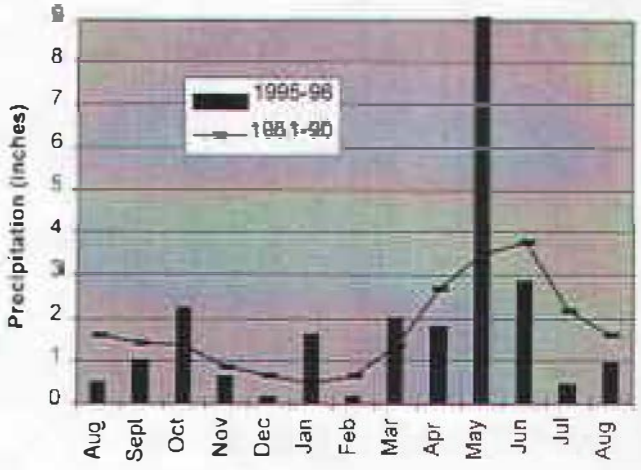




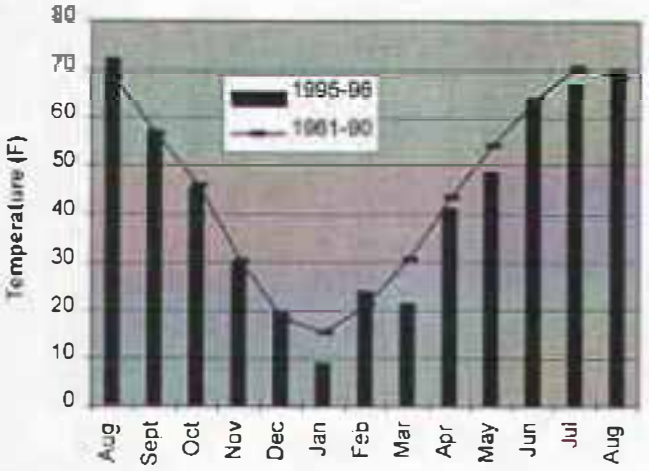
Average temperatures and precipitation obtained from NOAA Climatological Data and from Al Bender, State Climatologist at South Dakota State University. Weather data is collected from the reporting station nearest the experimental sites.

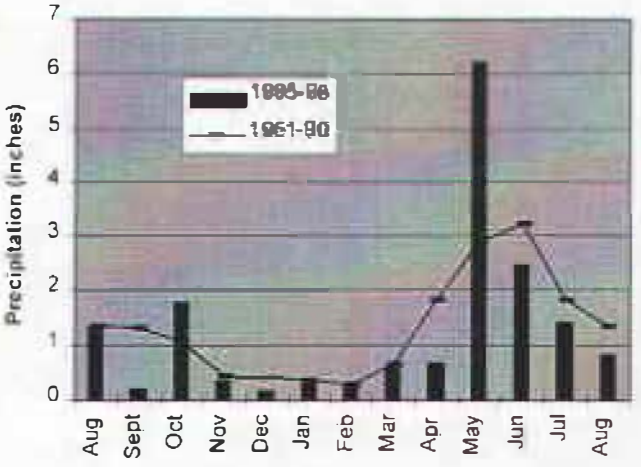
Temperature and Precipitation Charts for Ft. Meade (Meade County Reporting Station).



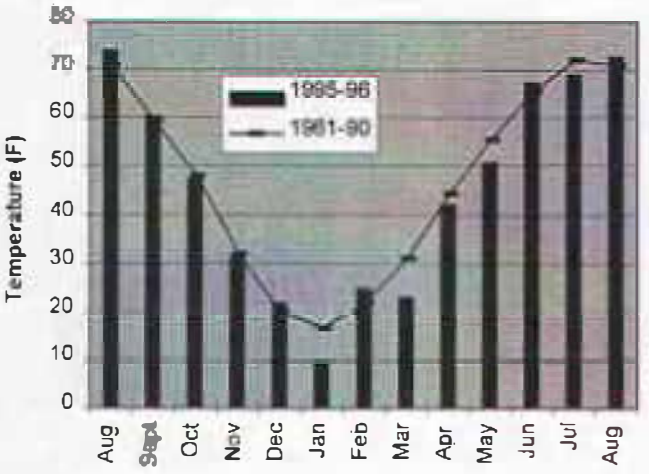


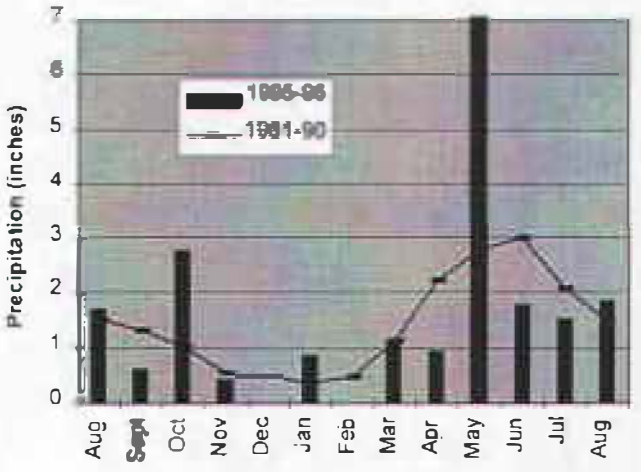
Temperature and Precipitation Charts for Ralph (Perkins County Reporting Station).





Temperature and Precipitation Charts for Bison (Harding County Reporting Station).

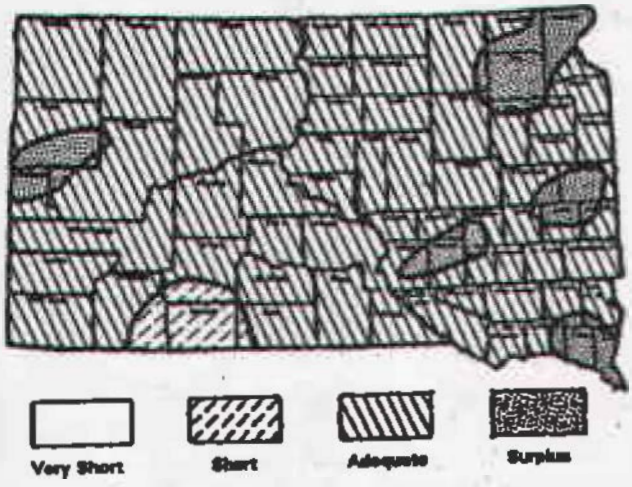




Average temperatures and precipitation obtained from NOAA Climatological Data and from Al Bender, State Climatologist at South Dakota State University. Weather data is collected from the reporting station nearest the experimental sites.

Table 1. Topsoil Moisture Conditions During 1996 Growing Season.
(Crop and Livestock Reporting Service - USDA)

As of Friday, April 12, 1996.



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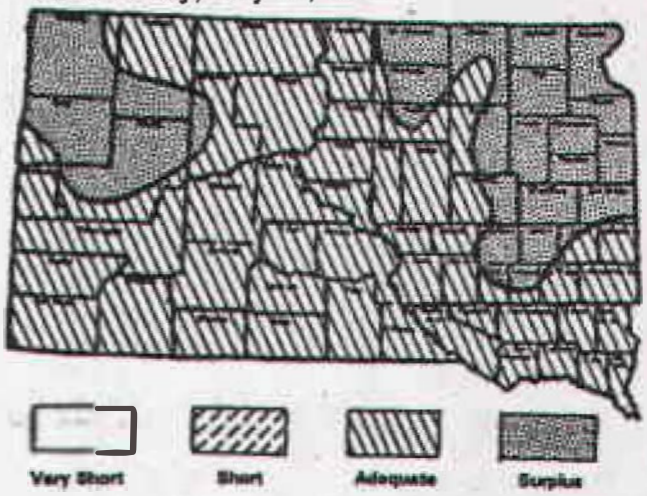

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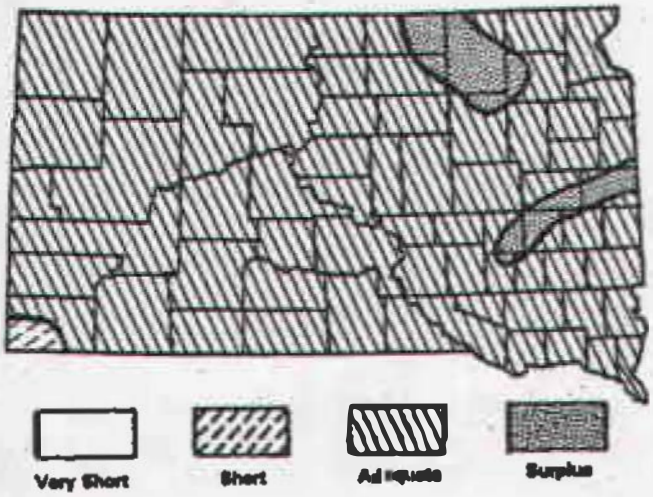

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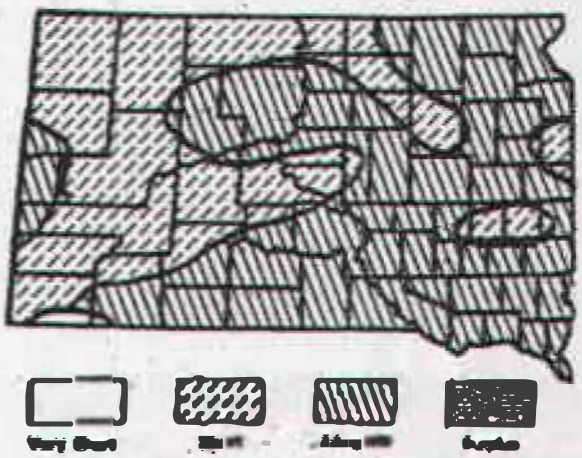
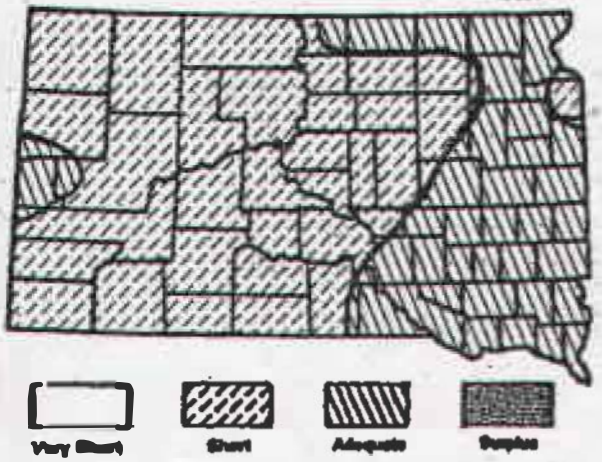


As of Friday, August 16, 1996.



As of Friday, September 20, 1996.

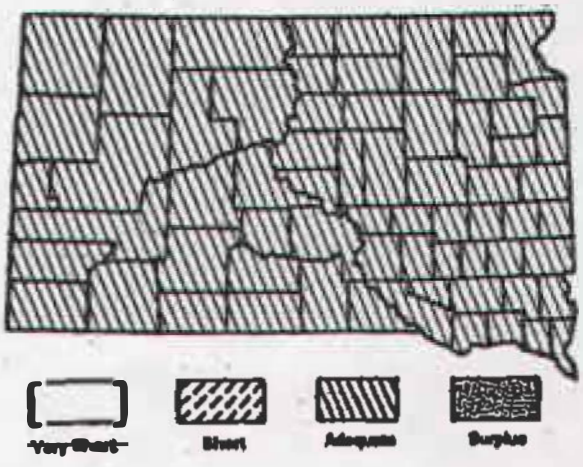


Table 2. Weather Data - Date of Critical Temperatures and Total Useable Precipitation in Counties with Experimental Plots (1995-96).

Location	Date of Temperature*		Total Useable Moisture**	
	Fall-First	Spring-Last	Aug. 95-July 96	April 96-July 96
Bennett County (Martin)	Sept. 22 (27°)	May 10 (28°)	11.89	6.85
Fall River County (Oelrichs)	Sept. 22 (24°)	May 5 (26°)	8.18	5.15
Harding County (Ralph)	Sept. 21 (17°)	May 9 (28°)	8.51	6.87
Jones County (Murdo)	Sept. 22 (22°)	April 22 (26°)	9.25	5.32
Meade County (Ft. Meade)	Sept. 21 (23°)	April 22 (24°)	13.75	10.10
Pennington County (Rapid City AP)	Sept. 21 (23°)	May 5 (26°)	10.81	8.26
Pennington County (Wasta)	Sept. 20 (27°)	April 29 (20°)	12.53	8.35
Perkins County (Bison)	Sept. 21 (25°)	May 9 (28°)	10.84	7.04
Haakon County (Kirley)	Sept. 21 (26°)	April 29 (26°)	11.87	7.06

* First 28° temperature in Fall or last 28° temperature in Spring, reported in degrees Fahrenheit.

** Sum of all precipitation where amounts were greater than .25 inch or totaled .25 inch in two contiguous days.

WINTER WHEAT VARIETY TRIALS

Objective: To evaluate standard and experimental hard red winter wheat varieties for yield, agronomic characteristics and adaptation to western South Dakota.

Procedure: Plots were seeded at seven locations in September 1995 with a John Deere 610 or John Deere 750 (Hayes no-till) plot drills with 10 inch spacing. All locations were fallow the previous year. A seeding rate of 950,000 seeds per acre (60 Lb/A) was used and liquid starter fertilizer (10-34-0 at 6.3 gal/A) applied at 7.4-25-0 pounds per acre. Herbicides were applied in either the fall or spring and varied according to weeds present. Visual stand ratings were taken in October 1995 and April 1996. The plots were trimmed to 5' x 25' after heading. The wheat was harvested in July and August with a small plot combine. Height, shatter, and lodging notes were taken at the time of harvest. Protein content was determined with a Near Infrared Spectrophotometer.

Location Summaries

Plots not Harvested

Location	Reason
Meade County - Bear Butte	Poor stands and hail
Butte County - Newell	Severe winterkill
Pennington County - Wall	Hail
Lyman County - Kennebec (drill strips)	Winterkill

Stanley County - Hayes

No-till Fallow

Planted: September 27, 1995 — Herbicide: Glean (⅓ oz/A) on October 18, 1996
Harvested: July 29, 1996 — Additional Nitrogen: None

Conventional Fallow

Planted: September 22, 1995 — Herbicide: Glean (⅓ oz/A) on October 18, 1996
Harvested: July 30, 1996 — Additional Nitrogen: None

The plots at Hayes looked good in the fall but suffered from harsh winter conditions and high winds in April. The stands were less than favorable, but yields averaged a respectable 59 Bu/A. The major differences between the no-till and conventional trial were a better stands and test weights in no-till. The no-till trial was also earlier in maturity by about a week which probably had some influence on the test weight. The growing conditions make it difficult to make yield comparisons between the two tillage practices. Overall, the more winterhardy varieties like Elkhorn and Seward performed the best this year. Other varieties that did well in 1996 were Quantum 565, Arapahoe and Windstar. Over the past three years SD89119, Tam 107, Arapahoe and Alliance performed the best. Results are shown in Tables 3 and 4.

Table 3. Hard Red Winter Wheat Variety Trial - Stanley County (Hayes), 1994-98

Variety	Stand Percent	Height Inches	Protein Percent	Test Wt. Lb/Bu	Yield Bu/A 1996	Yield Bu/A 1994-96
Alliance	62.5	26.8	11.3	58.3	48.0	37.7
Arapahoe	68.8	32.0	12.4	60.2	55.9	33.7
Nekota	62.5	26.8	13.8	58.9	49.7	35.9
Agripro AP7501	32.5	23.5	13.8	52.0	32.8	--
Quantum 566	65.0	31.5	13.6	59.5	54.4	36.8
Halt	46.3	24.5	13.3	58.9	35.6	--
Dawn	43.8	28.5	13.7	56.5	39.2	30.3
Jagger	27.5	25.5	14.3	56.0	32.0	--
2137	63.8	29.3	12.2	62.0	47.8	--
Niobrara	50.0	29.3	12.1	55.7	49.0	37.2
Redland	56.3	32.3	12.1	56.2	51.1	35.1
Elkhorn	68.8	36.8	11.9	58.6	58.5	--
Rose	57.5	32.8	12.9	58.1	47.9	33.6
Roughrider	77.5	37.3	12.3	61.9	54.7	29.6
Nuwest	45.0	34.3	13.0	52.6	54.3	--
Seward	58.8	35.0	11.6	56.3	57.9	36.9
Sage	58.8	32.8	13.1	57.7	39.3	29.9
Scout 66	60.0	34.5	12.9	59.8	50.4	35.5
Siouxland	60.0	33.3	13.1	61.1	56.0	33.8
Tam 107	65.0	26.8	12.2	59.9	48.1	39.3
Vista	57.5	26.5	13.1	57.8	42.6	34.8
Pronghorn	58.8	32.3	14.3	61.5	43.3	--
NE90479	48.8	29.8	11.7	61.0	51.4	--
Windstar	61.3	30.8	12.3	58.2	52.8	--
NE91631	48.8	32.8	12.8	48.7	49.8	--
SD89119	66.3	33.0	13.5	60.0	58.1	41.2
SD89153	66.3	31.3	12.7	59.5	50.7	36.7
SD89205	53.8	33.0	13.1	58.2	39.7	32.1
SD91192	61.3	32.8	12.7	60.1	56.1	--
SD92107	72.5	35.3	12.3	61.7	62.6	--
SD92124	58.8	31.3	13.5	57.3	54.1	--
SD92174	62.5	35.0	12.7	58.8	52.7	--
SD92191	60.0	37.3	13.6	61.8	60.8	--
SD92227	68.8	32.8	12.1	61.2	56.1	--
SD92266	61.3	34.5	12.4	58.7	60.0	--
Agripro AP7510	52.5	24.3	14.3	59.8	51.5	--
NE91648	57.5	34.0	13.7	57.6	50.9	--
Average	58.0	31.3	12.9	58.4	50.2	35.0
LSD (.05)	16.0	3.6	NA	5.5	9.9	NS
CV	19.0	7.9	NA	6.5	13.7	15.0

Table 4. No-Till Hard Red Winter Wheat Variety Trial - Stanley County (Hayes), 1996.

Variety	Stand Percent	Height Inches	Protein Percent	Test Wt. Lb/Bu	Yield Bu/A
Alliance	58.8	29.5	11.3	59.5	50.7
Arapahoe	61.3	30.8	12.9	60.2	55.4
Nekota	66.3	28.0	13.1	61.0	50.6
Agripro AP7501	56.3	25.8	13.8	57.5	44.5
Quantum 566	63.8	33.5	12.9	60.1	61.2
Halt	61.3	26.3	12.8	58.4	40.9
Dawn	73.8	31.0	13.2	58.6	53.5
Jagger	58.8	26.3	13.8	58.0	38.4
2137	68.8	27.8	12.7	60.7	51.4
Niobrara	67.5	32.8	12.4	58.9	56.6
Redland	72.5	32.3	12.1	57.7	54.9
Elkhorn	68.8	38.5	13.3	59.9	54.3
Rose	70.0	33.0	12.9	60.2	47.7
Roughrider	72.5	37.5	13.4	62.2	58.3
Nuwest	60.0	33.0	13.0	56.3	59.9
Seward	72.5	37.5	12.8	59.8	56.9
Sage	70.0	35.3	13.1	62.6	54.4
Scout 66	72.5	37.3	12.9	61.2	49.1
Siouxland	66.3	33.3	13.3	60.2	56.7
Tam 107	67.5	26.8	12.6	57.7	46.1
Vista	71.3	26.8	13.0	59.0	50.9
Pronghorn	65.0	35.3	12.6	61.4	55.4
NE90479	65.0	30.8	13.3	58.8	51.2
Windstar	72.5	32.5	12.8	58.8	56.4
NE91631	65.0	35.5	12.4	55.1	50.4
SD89119	71.3	35.0	13.8	61.0	56.4
SD89153	68.8	34.3	13.4	61.1	54.7
SD89205	76.3	33.5	13.0	61.1	51.7
SD91192	72.5	31.5	13.7	60.7	49.9
SD92107	61.3	35.3	13.0	59.9	60.3
SD92124	76.3	33.3	13.4	59.4	44.3
SD92174	70.0	35.3	13.3	62.1	54.2
SD92191	71.3	39.8	12.1	62.8	56.5
SD92227	70.0	32.5	13.0	59.4	56.5
SD92266	68.8	35.3	13.2	61.0	57.0
Agripro AP7510	76.3	27.0	13.2	62.3	54.8
NE91648	71.3	34.3	13.1	59.9	55.0
Average	68.1	32.5	13.0	59.9	52.9
LSD (.05)	15.0	2.8	NA	2.3	8.1
CV	15.0	5.9	NA	2.6	10.6

Fall River County - Oelrichs

Planted: September 25, 1995
Harvested: July 24, 1996

Herbicide: Glean (⅓ oz/A) on October 20, 1996
Additional Nitrogen: 50 Lb/A (actual) 28-0-0 on March 22.

Oelrichs had good stands and favorable growing conditions in 1996. Yields averaged 51 Bu/A with test weights averaging 61.5 Lb/Bu. Arapahoe, Siouxland, Niobrara, Quantum 566 and AP7510 were top yielders in 1996. Alliance, Arapahoe and Tam 107 had the best three year averages ('93,'94,'96). Results shown in Table 5.

Bennett County - Martin

Planted: September 25, 1995
Harvested: August 6, 1996

Herbicide: Glean (⅓ oz/A) on October 20, 1996
Additional Nitrogen: 20 Lb/A (actual) 28-0-0 on March 22.

The Martin trial suffered from a hard rain before emergence that caused reduced stands. The hard winter reduced stands even more to an average of 41 percent. These conditions led to moderate yields averaging 44 Bu/A with a test weights averaging 59 Lb/Bu. Winterhardy varieties Elkhorn, Roughrider, Quantum 566 and Rose did well in 1996. Over the past three years Quantum 566, Arapahoe and Niobrara did well. Results shown in Table 6.

Perkins County - Bison

Planted: September 17, 1995
Harvested: August 8, 1996

Herbicide: Glean (⅓ oz/A) on October 16, 1996
Additional Nitrogen: 20 Lb/A (actual) 28-0-0 on March 22.

Bison was a good location this year with yields averaging 57 Bu/A with test weights near 62 Lb/Bu. Proteins were excellent averaging 13.7 percent. The varieties that did well in 1996 were Quantum 566, Arapahoe, Seward and Rose. The best three year performers were Quantum 566, Alliance, Rose and Seward. Results shown in Table 7.

Table 5. Hard Red Winter Wheat Variety Trial - Fall River County (Oelrichs), 1993-96.

Variety	Stand Percent	Height Inches	Lodging 1-5*	Protein Percent	Test Wt. Lb/Bu	Yield Bu/A 1996	Yield Bu/A 1993,94,96
Alliance	83.8	29.3	1.0	10.6	60.9	54.5	59.1
Arapahoe	87.5	32.5	1.0	11.7	60.8	57.8	57.0
Nekota	85.0	28.0	1.0	12.2	61.7	48.8	54.1
Agripro AP7501	82.5	25.3	1.0	13.3	61.7	46.9	--
Quantum 566	86.3	33.0	1.0	12.1	61.3	55.8	--
Halt	85.0	26.8	1.0	12.0	61.9	54.4	--
Dawn	86.3	31.3	1.0	12.6	62.6	46.6	54.8
Jagger	87.5	29.5	1.0	13.1	62.5	46.8	--
2137	82.5	27.0	1.0	12.3	62.2	47.1	--
Niobrara	88.8	32.3	1.0	10.7	60.1	55.3	--
Redland	85.0	31.0	1.0	11.3	59.3	50.7	53.6
Elkhorn	87.5	39.3	1.0	12.7	60.2	47.6	--
Rose	87.5	35.0	1.0	12.7	62.6	49.9	51.8
Roughrider	88.8	37.5	1.0	12.0	61.9	45.9	48.8
Nuwest	85.0	34.0	1.0	11.9	60.5	47.0	--
Seward	77.5	35.5	1.0	12.2	58.8	42.8	52.2
Sage	90.0	35.0	1.0	12.0	62.8	54.5	52.7
Scout 66	86.3	36.3	1.8	11.9	62.3	49.0	51.4
Siouxland	88.8	35.8	1.0	12.1	61.7	55.7	55.4
Tam 107	82.5	28.5	1.0	12.3	61.5	46.8	55.9
Vista	82.5	28.3	1.0	12.4	61.8	52.5	55.4
Pronghorn	88.8	35.5	1.3	10.7	62.6	54.7	--
NE90479	86.3	31.5	1.0	13.1	62.6	48.7	--
Windstar	88.8	32.8	1.0	11.1	61.6	60.2	--
NE91631	81.3	35.8	1.0	11.6	60.3	51.6	--
SD89119	88.8	33.5	1.0	12.6	63.5	53.7	54.1
SD89153	86.3	33.5	1.0	11.8	61.9	53.3	53.2
SD89205	77.5	33.3	1.0	12.4	62.2	46.7	--
SD91192	87.5	34.3	1.0	12.6	61.4	52.4	--
SD92107	88.8	35.5	1.0	12.0	60.6	57.8	--
SD92124	85.0	31.5	1.0	12.3	60.8	51.5	--
SD92174	87.5	36.0	1.0	12.4	61.1	50.6	--
SD92191	83.8	38.0	1.0	11.2	62.0	52.9	--
SD92227	88.8	33.0	1.0	11.1	60.6	58.2	--
SD92266	81.3	34.8	1.0	12.1	61.5	54.2	--
Agripro AP7510	86.3	28.5	1.0	11.6	62.9	58.3	--
NE91648	83.8	32.5	1.0	11.6	61.8	50.8	--
Average	85.6	32.7	1.0	12.0	61.5	51.7	54.0
LSD (.05)	7.0	2.4	NA	NA	1.2	5.4	NA
CV	5.0	5.2	NA	NA	1.4	7.2	NA

* 1=No lodging, 5 = >80% lodged.

Table 6. Hard Red Winter Wheat Variety Trial - Bennet County (Martin), 1994-96

Variety	Stand Percent	Height Inches	Protein Percent	Test Wt. Lb/Bu	Yield Bu/A 1996	Yield Bu/A 1994-96
Alliance	33.8	30.3	11.3	57.5	41.2	55.2
Arapahoe	35.0	32.5	12.3	58.8	49.2	57.2
Nekota	45.0	29.3	13.7	59.6	45.6	52.8
Agripro AP7501	45.0	25.0	13.6	56.6	30.1	--
Quantum 566	46.3	33.0	13.4	59.8	56.1	62.4
Halt	61.3	25.3	13.4	54.2	23.9	--
Dawn	38.8	30.0	12.8	56.8	35.0	49.3
Jagger	46.3	27.0	14.2	55.8	12.5	--
2137	33.8	28.0	12.8	58.7	45.8	--
Niobrara	46.3	33.3	12.4	58.1	48.4	56.2
Redland	35.0	31.8	11.7	58.4	45.9	52.9
Elkhorn	43.8	42.8	13.6	60.7	58.8	--
Rose	25.0	36.5	14.3	62.3	54.1	56.9
Roughrider	43.8	40.8	14.7	62.0	57.3	51.1
Nuwest	43.8	34.8	13.8	53.6	39.9	--
Seward	38.8	37.5	12.3	58.0	48.8	53.6
Sage	45.0	36.5	13.1	59.8	46.7	50.3
Scout 66	47.5	35.0	14.0	59.5	45.6	48.7
Siouxland	46.3	34.8	13.5	59.3	43.7	47.3
Tam 107	51.3	25.3	12.5	56.7	31.9	47.3
Vista	37.5	27.0	13.2	56.3	33.2	49.1
Pronghorn	45.0	32.3	12.8	59.5	33.7	--
NE90479	56.3	30.5	12.6	59.9	37.6	--
Windstar	36.3	33.5	13.1	59.5	53.5	--
NE91631	23.8	34.0	12.3	56.9	43.4	--
SD89119	38.8	35.0	14.7	60.0	43.2	50.6
SD89153	55.0	34.5	14.6	62.4	48.6	55.0
SD89205	38.8	32.8	12.5	57.6	37.2	49.3
SD91192	22.5	32.5	13.6	59.4	48.2	--
SD92107	30.0	36.8	13.9	60.4	58.3	--
SD92124	37.5	33.3	13.5	59.5	47.1	--
SD92174	32.5	38.3	14.4	61.3	57.9	--
SD92191	40.0	41.5	12.1	61.8	56.3	--
SD92227	51.3	33.3	12.7	58.9	48.2	--
SD92266	45.0	34.8	13.8	61.3	55.8	--
Agripro AP7510	42.5	27.8	12.9	60.0	47.2	--
NE91648	52.5	33.5	13.3	58.4	34.0	--
Average	41.5	33.0	13.2	58.9	44.4	52.5
LSD (.05)	12.0	2.6	NA	2.2	7.4	NS
CV	20.0	5.5	NA	2.5	11.5	8.0

Table 7. Hard Red Winter Wheat Variety Trial - Perkins County (Bison), 1994-96.

Variety	Stand Percent	Height Inches	Protein Percent	Test Wt. Lb/Bu	Yield Bu/A 1996	Yield Bu/A 1994-96
Alliance	90.0	30.0	12.3	61.8	60.8	57.0
Arapahoe	90.0	33.5	13.2	61.6	62.9	52.1
Nekota	90.0	29.8	14.6	62.5	53.3	51.6
Agripro AP7501	86.3	24.5	14.4	61.1	49.3	--
Quantum 566	90.0	33.0	13.7	61.4	69.2	61.6
Halt	86.3	25.8	14.5	59.9	42.9	--
Dawn	90.0	30.3	13.2	62.4	59.4	54.1
Jagger	85.0	26.3	14.4	61.0	54.1	--
2137	90.0	28.3	13.5	61.1	55.4	--
Niobrara	88.8	32.8	13.5	60.1	58.7	51.7
Redland	90.0	34.3	12.8	59.9	57.5	52.9
Elkhorn	90.0	39.3	13.0	61.5	58.6	--
Rose	90.0	34.3	14.3	63.4	60.9	56.7
Roughrider	90.0	41.3	15.0	63.3	59.8	50.9
Nuwest	90.0	34.0	13.6	61.3	59.6	--
Seward	90.0	38.8	12.3	61.7	62.3	54.9
Sage	90.0	35.8	13.8	62.7	59.9	52.0
Scout 66	90.0	37.8	14.2	62.8	54.6	51.5
Siouxland	90.0	37.0	13.5	61.4	57.8	50.4
Tam 107	90.0	26.0	13.8	59.9	43.4	47.1
Vista	87.5	28.5	14.2	61.4	53.0	51.2
Pronghorn	90.0	35.3	13.8	62.4	60.3	--
NE90479	83.8	31.0	14.7	62.2	51.1	--
Windstar	90.0	33.5	12.6	60.7	62.6	--
NE91631	85.0	33.0	12.9	60.4	60.3	--
SD89119	83.8	33.0	15.5	62.0	54.1	54.2
SD89153	87.5	34.0	14.5	63.0	53.6	52.0
SD89205	78.8	33.0	12.9	61.9	43.1	53.1
SD91192	88.8	32.3	14.1	62.0	58.3	--
SD92107	90.0	35.0	13.6	62.4	66.3	--
SD92124	90.0	33.3	14.6	60.1	54.4	--
SD92174	90.0	36.5	14.9	62.6	60.4	--
SD92191	86.3	39.0	11.9	62.7	60.7	--
SD92227	90.0	32.5	13.0	61.9	59.4	--
SD92266	90.0	36.0	13.2	62.6	60.7	--
Agripro AP7510	90.0	25.8	14.3	63.1	53.3	--
NE91648	90.0	32.5	13.6	62.6	58.3	--
Average	88.6	32.9	13.7	61.8	57.0	53.1
LSD (.05)	6.0	3.2	NA	1.2	7.9	NS
CV	5.0	6.7	NA	1.3	9.6	12.0

Mellette County - Norris

The winter wheat variety strips near Norris were planted in early September 1995 with a farm sized deep furrow drill. The ground was in winter wheat the previous year. The varieties were seeded in five foot strips 400 feet long. The plot had good stands and favorable growing conditions but suffered form lodging and weed problems. A 40 foot strip was harvested on August 6 with a small plot combine and the information presented in Table 8. This was a single rep trial, so the information is not statistically analyzed. Since this was a single rep trial without check strips, variety comparisons should be made very carefully.

Table 8. Hard Red Winter Wheat Variety Strip - Mellette County (Norris), 1996.

Variety	Height Inches	Lodging 1-5*	Test Wt. Lb/Bu	Yield Bu/A	Moisture Percent
Scout66	38	5	57.3	45.1	13.8
Alliance	35	5	54.2	47.5	13.1
Siouxland	39	4	55.7	52.6	12.8
Arapahoe	34	3	52.6	46.3	12.0
Sage	38	3	57.4	46.0	13.8
Redland	34	2	52.8	41.5	14.4
Vista	35	3	61.8	59.4	11.6
Dawn	35	3	61.7	55.0	11.7
Rose	35	2	62.4	56.0	12.1
SD 89119	34	3	63.4	54.2	11.3
SD 89153	34	3	63.1	56.8	11.7
Nekota	33	2	60.2	59.0	11.1
Niobrara	36	2	59.3	52.6	11.5
Halt	29	2	57.3	42.2	10.3
Roughrider	41	2	62.9	43.3	11.6
Seward	36	3	60.5	46.6	12.1
Elkhorn	42	2	61.7	52.9	11.6
Nuwest	38	2	61.1	46.0	13.1
Jagger	26	3	57.0	51.5	12.0
Tam 107	27	3	55.9	50.6	12.0
Agripro AP 7501	27	2	59.7	48.0	12.3
Tomahawk	26	2	55.0	43.6	12.3
Laredo	31	2	55.4	44.6	12.8
Hickok	30	2	57.3	42.4	13.1
Plot Average	33.9	2.7	58.6	49.3	12.3

* 1=No lodging, 5 = >80% lodged.

WHEAT VARIETY RECOMMENDATIONS FOR 1997

Crop Adaptation Areas for South Dakota

(Revised 1992)

WINTER WHEAT

Recommended:	Variety Area
Alliance®	3,4*,5,6
Arapahoe®	1*,3,4*,5,6,7
Nekota	1*,3,4*,5,6,7*
Quantum 566 (hybrid)	1*,3,4*,5,6,7*
Rose	1*,2*,3†,4*,6,7
Seward	1*,2*,4*,6,7
Vista ®	3,4*,5,6

Acceptable/Promising:	Variety Area
Dawn ®	4*,5,6
Pronghorn	4*,5,6,
Roughrider	1*,2*,4,7
Siouxland ®	3,4*,5,6
TAM 107 ®	4*,5,6
Windstar	1*,3,4*,5,6,7*

SPRING WHEAT

Recommended:	Variety Area
Butte 86	Statewide
Sharp	Statewide
2375 ® #	Statewide
Russ®	Statewide
Oxen ®	Statewide

Acceptable/Promising:	Variety Area
Kulm®	Statewide
Nordic®	Statewide
Prospect	1‡,4‡,6,7
Verde ®	Statewide

DURUM WHEAT

Recommended:	Variety Area
Munich	All durum areas
Monroe	All durum areas
Renville	All durum areas
Vic	All durum areas

® U.S. Plant Variety Protection applied for and/or issued; seed sales of these varieties are restricted to classes of certified seed.

* Plant into [illegible] cover.

2375 is owned by the North Dakota State University Research Foundation (NDSURF). Seed is available for increase and sale as a class of certified seed through an agreement between NDSURF and South Dakota Foundation Seed Stocks Division of SDSU.

† Northern half of crop adaptation area.

‡ Western half of crop adaptation area.

Source - Small Grains 1997 Variety Recommendations, EC744

SPRING WHEAT VARIETY TRIALS

Objective: To evaluate standard and experimental hard red spring wheat varieties for yield, agronomic characteristics and adaptation to western South Dakota.

Procedure: Plots were seeded at three locations in April 1996 with a John Deere 610 plot drill with 10 inch spacing. All locations were fallow the previous year. A seeding rate of 1,390,000 seeds per acre (90 Lb/A) was used and liquid starter fertilizer (10-34-0 at 6.3 gal/A) applied at 7.4-25-0 pounds per acre. Herbicides were applied in early June and varied according to weeds present. Plots were trimmed to 5' x 25' after heading. The wheat was harvested in July and August with a small plot combine. Height, shatter, and lodging notes were taken at the time of harvest. Protein content was determined with a Near Infrared Spectrophotometer.

Location Summaries

Plots not Harvested

Location	Reason
Pennington County - Wall	Hail

Perkins County - Bison

Planted: April 29, 1996
Harvested: August 20, 1996

Herbicide: Ally ($^{1}/_{10}$ oz/A) + 2,4-D (5.3 oz/A LV-6), June 7.
Additional Nitrogen: None

Bison had excellent stands and favorable growing conditions in 1996. The plot averaged 46.9 Bu/A and test weights averaged 60.7 Lb/Bu. Protein contents averaged 13.4 percent. The best yielders in 1996 are SD 3219, Nordic, Russ and Oxen. Varieties with good three year averages are Nordic, Oxen, Russ and Sharp. Nordic had the lowest protein content of all the varieties in this trial. Results are shown in Table 9.

Harding County - Ralph

Planted: April 29, 1996
Harvested: August 19, 1996

Herbicide: Bronate (16 oz/A) + Holeon (40 oz/A) , June 7.
Additional Nitrogen: None

Growing conditions for spring grains were excellent at Ralph in 1996. The average yield was 49.2 Bu/A with test weights running around 60 Bu/A.. Protein contents were lower than expected averaging 11.7 percent. 1996 top yielders are 2398, SD3219, Oxen, Grandin, Nordic, and Trenton. Over the past three years Nordic, Oxen, Russ and Trenton have looked the best. As expected Nordic had a very low protein content at 9.5 percent. Results are presented in Table 10.

Table 9. Hard Red Spring Wheat Variety Trial - Perkins County (Bison), 1994-96.

Variety	Height Inches	Protein Percent	Test Wt. Lb/Bu	Yield Bu/A 1996	Yield Bu/A 1994-96
Bacup	29.5	12.0	61.4	35.5	--
Butte 86	34.8	13.5	61.4	49.8	37
Chris	36.8	14.3	60.1	38.5	28
Ernest	35.8	13.7	61.2	42.9	--
Grandin	29.0	14.5	59.9	48.8	35
Hammer	26.3	13.9	60.4	47.5	--
Kulm	34.0	14.3	62.6	48.2	36
Lars	24.5	12.6	58.3	47.6	--
Nordic	30.0	11.2	61.2	55.1	42
Norlander	26.5	14.1	59.9	43.2	--
Prospect	29.8	13.7	60.1	45.5	35
Russ	36.0	13.3	59.9	53.2	39
Sharp	33.5	13.8	62.4	48.4	38
Trenton	35.5	14.5	61.5	46.2	33
Verde	28.8	12.7	57.8	50.3	38
2375	27.0	13.3	60.5	49.0	37
2398	26.3	13.1	60.3	48.7	--
Keene	35.0	14.1	61.9	45.2	--
Oxen	27.5	13.9	60.5	50.3	39
Vanna	27.5	-	57.7	49.1	--
SD 3156	31.0	13.3	62.0	44.5	--
SD 8089	32.5	12.6	59.3	47.5	--
SD 8108	32.8	13.4	61.5	44.7	--
SD 3219	30.3	13.0	63.8	55.4	--
SD 3236	32.8	13.8	61.3	43.1	--
SD 3249	33.0	14.7	62.5	39.9	--
AVERAGE	31.0	13.5	60.7	46.9	36
LSD (.05)	3.0	NA	1.5	8.8	NS
CV	6.7	NA	1.7	13.0	13

Good trial, summary on page 16.

Table 10. Hard Red Spring Wheat Variety Trial - Harding County (Ralph), 1994-96.

Variety	Height Inches	Protein Percent	Test Wt. Lb/Bu	Yield Bu/A 1996	Yield Bu/A 1994-96
Bacup	29.5	15.2	62.9	37.8	–
Butte 86	29.0	12.1	60.5	45.6	32
Chris	33.5	11.9	56.9	36.5	26
Ernest	34.8	11.9	54.6	50.0	–
Grandin	29.5	11.4	60.5	55.0	34
Hammer	24.8	11.6	59.7	44.8	–
Kulm	29.3	12.6	59.0	37.1	29
Lars	21.3	11.2	58.8	47.0	–
Nordic	25.8	9.5	56.8	54.3	37
Norlander	27.0	11.3	60.0	51.2	–
Prospect	27.0	11.6	59.6	47.8	33
Russ	29.5	11.0	60.2	49.9	34
Sharp	30.5	12.0	61.5	45.9	32
Trenton	34.3	11.6	60.6	53.8	35
Verde	26.8	12.2	59.9	50.9	34
2375	26.3	13.4	61.7	47.1	31
2398	25.5	13.2	61.0	59.2	–
Keene	33.5	11.4	58.0	52.0	–
Oxen	27.0	11.0	61.7	58.7	36
Vanna	25.3	-	60.3	52.4	–
SD 3156	28.5	10.7	61.8	52.6	–
SD 8089	30.5	10.4	59.8	50.2	–
SD 8108	30.3	11.0	61.0	53.3	–
SD 3219	29.8	10.3	63.0	59.1	–
SD 3236	30.0	12.2	59.9	41.8	–
SD 3249	30.3	11.5	62.2	44.9	–
AVERAGE	28.8	11.7	60.1	49.2	33
LSD (.05)	1.9	NA	2.4	6.6	NS
CV	4.5	NA	2.7	9.3	11

Excellent trial, summary on page 16.

DURUM WHEAT VARIETY TRIALS

Objective: To evaluate standard and experimental durum wheat varieties for yield, agronomic characteristics and adaptation to western South Dakota.

Procedure: Plots were seeded at three locations in April 1996 with a John Deere 610 plot drill with 10 inch spacing. All locations were fallow the previous year. A seeding rate of 1,390,000 seeds per acre (90 Lb/A) was used and liquid starter fertilizer (10-34-0 at 6.3 gal/A) applied at 7.4-25-0 pounds per acre. Herbicides were applied in early June and varied according to weeds present. Plots were trimmed to 5' x 25' after heading. The wheat was harvested in July and August with a small plot combine. Height, shatter, and lodging notes were taken at the time of harvest. Protein content was determined with a Near Infrared Spectrophotometer.

Location Summaries

Plots not Harvested

Location	Reason
Pennington County - Wall	Hail

Perkins County - Bison

Planted: April 30, 1996
Harvested: August 20, 1996

Herbicide: Bronate (16 oz/A), on June 7.
Additional Nitrogen: None

Yields at Bison were typical in 1996 averaging 34.7 Bu/A with a 60.4 Lb/Bu test weight average. Proteins were good averaging 13.5 percent. The varieties Renville and Vic yielded significantly better than the other varieties in 1996. The three year averages showed no significant difference between varieties tested over that period. Results are shown in Table 11.

Harding County - Ralph

Planted: April 29, 1996
Harvested: August 19, 1996

Herbicide: Bronate (16 oz/A) + Hoelon (40 oz/A) , June 7.
Additional Nitrogen: None

Ralph had excellent conditions for durum wheat in 1996 with the averge yield of 58.4 Bu/A being higher than we normally have seen at Ralph. Test weights were excellent at 62.1 Lb/Bu and protein averaged 13 percent. Renville and Munich were the top varieties in 1996 and the three year averages showed no significant difference in yield among varieties. Results are shown in Table 12.

Table 11. Durum Wheat Variety Trial - Perkins County (Bison), 1994-96.

Variety	Height	Protein	Test Wt.	Yield	Bu/A
	Inches	Percent	Lb/Bu	1996	1994-96
Monroe	33.8	13.7	59.2	36.1	28
Munich	29.0	13.4	59.7	33.3	25
Renville	35.8	13.3	60.4	41.5	32
Vic	36.0	13.3	61.6	40.3	28
Ben	33.3	13.6	60.9	33.7	--
Fjord	34.3	--	60.8	29.9	28
AVERAGE	33.7	13.5	60.4	35.8	28
LSD (.05)	2.5	NA	1.2	5.7	NS
CV	4.9	NA	1.3	10.6	12

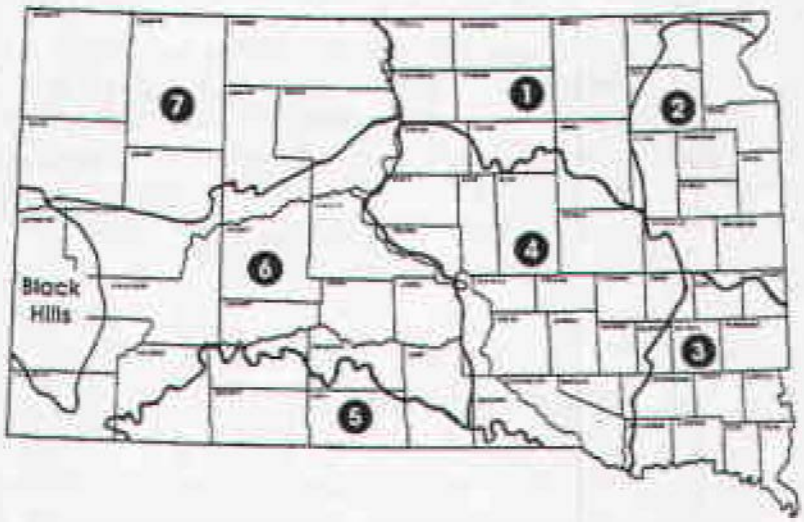
Table 12. Durum Wheat Variety Trial - Harding County (Ralph), 1994-96.

Variety	Height	Protein	Test Wt.	Yield	Bu/A
	Inches	Percent	Lb/Bu	1996	1994-96
Monroe	32.3	13.5	61.8	58.0	33
Munich	29.8	13.2	62.4	60.8	35
Renville	33.8	12.1	62.5	62.9	38
Vic	36.5	--	62.3	57.3	34
Ben	34.3	13.1	61.4	57.7	--
Fjord	34.8	--	62.1	54.0	33
AVERAGE	33.5	13.0	62.1	58.4	35
LSD (.05)	1.9	NA	1.1	3.2	NS
CV	3.8	NA	1.1	3.6	7

OAT AND BARLEY VARIETY RECOMMENDATIONS FOR 1997

Crop Adaptation Areas for South Dakota

(Revised 1992)



OATS

Recommended:	Variety Area
Don	1,4†,5,6,7
Jerry ®	Statewide
Troy	1,2,4†,6,7
Valley	1,2,4†
Acceptable/Promising:	Variety Area
Newdak ®	1,2,7
Settler	Statewide

SPRING BARLEY

Recommended:	Variety Area
Excel ®	1,2,4,6,7
Robust ®	1,2,4,6,7
Stander ®	Statewide
Stark	Statewide
Foster	Statewide
Logan	1,4†,6,7
Acceptable/Promising:	Variety Area
Bowman	Statewide

Excel, Foster, Robust and Stander are approved American Malting Barley Association varieties.

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§ U. S. Plant Variety Protection applies for certain uses and sales of these varieties are restricted to classes of certified seed.

† Northern half of crop reporting area.

Source - Small Grains 1997 Variety Recommendations, EC744

OAT VARIETY TRAILS

Objective: To evaluate standard and experimental oat varieties for yield, agronomic characteristics and adaptation to western South Dakota.

Procedure: Plots were seeded at three locations in April 1996 with a John Deere 610 plot drill with 10 inch spacing. All locations were fallow the previous year. A seeding rate of 1,390,000 seeds per acre (64 Lb/A) was used and liquid starter fertilizer (10-34-0 at 6.3 gal/A) applied at 7.4-25-0 pounds per acre. Herbicides were applied in early June and varied according to weeds present. Plots were trimmed to 5' x 25' after heading. The oats were harvested in July and August with a small plot combine. Height, shatter, and lodging notes were taken at the time of harvest.

Location Summaries

Plots not Harvested

Location	Reason
Pennington County - Wall	Hail
Meade County - Bear Butte	Hail

Perkins County - Bison

Planted: April 29, 1996
Harvested: August 20, 1996

Herbicide: Bronate (16 oz/A), June7.
Additional Nitrogen: None

Oat yields were excellent this year at Bison. The trial averaged 86.2 Bu/A with some varieties averaging over 100 Bu/A. Test weights were also very good averaging 41 Lb/Bu. Newdak and Monida were the best varieties in 1996. Over the 1994-96 time period Newdak, Monida, Jerry, Troy and Valley had the best yields. Results are presented in Table 13.

Table 13. Oat Variety Trial - Perkins County (Bison), 1994-96.

Variety	Height Inches	Test Wt. Lb/Bu	Yield 1996	Bu/A 1994-96
Belle	35.8	40.3	84.7	78
Dane	33.0	39.6	92.0	81
Don	31.3	41.1	86.9	81
Hazel	29.0	40.9	81.0	75
Hytest	38.3	44.4	70.2	67
Jerry	38.5	41.8	96.4	89
Jim	36.3	41.8	84.7	--
Monida	37.3	35.7	101.7	93
Newdak	33.8	37.8	106.2	96
Settler	34.8	41.6	87.1	78
Troy	38.0	41.1	87.7	86
Valley	31.5	41.4	99.2	87
SD 91008	32.8	40.8	74.7	--
SD 91228	36.3	42.2	72.9	--
SD 92125	33.8	40.3	75.6	--
SD 92057	37.3	43.8	77.6	--
SD 92287	38.8	43.0	77.1	--
Celsia	37.8	40.3	96.2	--
AVERAGE	35.2	41.0	86.2	83
LSD (.05)	2.0	2.2	5.8	15
CV	4.0	3.7	4.6	9

SPRING BARLEY VARIETY TRIALS

Objective: To evaluate standard and experimental spring barley varieties for yield, agronomic characteristics and adaptation to western South Dakota.

Procedure: Plots were seeded at two locations in April 1996 with a John Deere 610 plot drill with 10 inch spacing. All locations were fallow the previous year. A seeding rate of 1,210,000 seeds per acre (117 Lb/A for two row, 83 Lb/A for six-row) was used and liquid starter fertilizer (10-34-0 at 6.3 gal/A) applied at 7.4-25-0 pounds per acre. Herbicides were applied in early June and varied according to weeds present. Plots were trimmed to 5' x 25' after heading. The wheat was harvested in July and August with a small plot combine. Height, shatter, and lodging notes were taken at the time of harvest.

Location Summaries

Plots not Harvested

Location	Reason
Pennington County - Wall	Hail
Perkins County - Bison	Grasshoppers

It was not a good year for barley trials West River. The Wall location was devastated by hail in early July and the Bison location was destroyed by grasshoppers in August. Because of this there is no data to report for barley this year.

SAFFLOWER VARIETY TRIAL

Objective: To evaluate safflower varieties for yield and adaptation to western South Dakota.

Procedure: Nine varieties were planted at 20 Lb/A in randomized complete block experiment with four replications near Wall and Bear Butte, South Dakota. The previous year was fallow and Treflan was incorporated at 1 Lb active ingredient/Acre before planting. The plots were planted on April 23 and 24 with a John Deere 610 drill set to 20 inch row spacing.

Both locations were destroyed by the big hailstorm in early July and were abandoned at that time.

FIELD PEA VARIETY TRIALS

Objective: To evaluate field pea varieties for yield and adaptation to western South Dakota.

Procedure: Field peas were planted in a randomized complete block experiment with four replications near Selby, Wall and Ralph, South Dakota. The Wall and Selby trial had fifteen entries, the Ralph trial had four entries. Also 4 field pea varieties were planted in strips 10' x 60' near Bison, South Dakota. A seeding rate of 300,000 seeds/A (85 - 165 Lb/A) was used. The peas were inoculated with a peat based inoculum just prior to planting. A John Deere 610 drill with 10 inch spacing was used to plant the trials in April 1996. The peas were harvested for grain in August with a Wintersteiger small plot combine equipped with vine lifters and a pickup reel. The results are given in Tables 15 - 17. Table 14 shows variety characteristics.

Summary: The yields at all three locations averaged around 22 Bu/A. This was slightly less than expected, but the drier than normal conditions in June and July probably reduced yields somewhat. At Wall the varieties Grande, Swing, Astina and Delta were the top yield group. This plot was harvested somewhat late as some of the early varieties had started to shatter. The addition of vine lifters to the combine this year greatly aided in ease of harvest. Even the lodged varieties were fairly easy to combine with them attached.

At Raplh and Bison the varieties Profi and Arvika looked good. In the western part of the state the normal leaf, long vine types are probably a better choice. They are more drought tolerant and more indeterminate in their flowering

Plots not Harvested

Location	Reason
Walworth County - Selby	Hail

Table 14. Field Pea Characteristics.

Variety	Color	Leaf Type	Vine Length	Seed Size	Maturity
Arvika	Mottled	Normal	Long	Small	Late
Trapper	Yellow	Normal	Long	Small	Late
Grande	Yellow	Normal	Long	Medium	Med - Late
Yorkton	Yellow	Normal	Long	Medium	Med - Early
Express	Yellow	Normal	Short	Medium	Medium
Profi	Yellow	Semi-Leafless	Short	Large	Early
Highlight	Yellow	Semi-Leafless	Short-Med	Small - Med	Early
Carneval	Yellow	Semi-Leafless	Short-Med	Medium	Medium
Miko	Yellow	Semi-Leafless	Short	Medium	Medium
Delta	Yellow	Semi-Leafless	Medium	Medium	Early
Swing	Yellow	Semi-Leafless	Medium	Med - Large	Early
Radley	Green	Semi-Leafless	Short	Small	Early
Majoret	Green	Semi-Leafless	Short-Med	Medium	Early
Espace	Green	Semi-Leafless	Short-Med	Large	Early
Astina	Green	Semi-Leafless	Short-Med	Medium	Early

Table 15. Field Pea Variety Trial - Pennington County (Wall), 1995-96.

Variety	Height Inches	Shatter 1-5*	Lodging 1-5**	Percent Protein	Seeds/ Lb	Test Wt. Lb/Bu	Yield Bu/A 1996	Yield Bu/A 1995-96
Arvika	26.8	1.0	5.0	24.3	3044	62.5	23.2	21.1
Trapper	20.0	1.0	5.0	23.6	3718	63.1	19.2	18.9
Grande	19.0	1.0	1.0	21.8	2291	63.5	**28.8**	
Yorkton	16.5	1.0	2.5	24.6	2326	62.0	22.5	
Express	14.8	1.0	3.8	23.7	2439	61.0	20.2	
Profi	17.3	1.0	2.0	21.1	2363	61.6	23.6	24.0
Highlight	15.8	1.3	2.8	20.8	3004	62.7	20.6	
Carneval	19.5	1.0	2.3	21.5	2548	61.9	21.8	
Miko	17.8	1.0	3.5	24.3	2234	60.8	21.7	
Delta	17.0	1.0	2.3	19.5	2439	58.6	**24.2**	
Swing	19.0	1.0	1.8	22.5	2668	61.7	**25.9**	
Radley	15.3	1.8	3.0	21.7	2945	62.5	18.5	16.1
Majoret	18.0	1.5	2.0	21.5	2326	63.0	20.1	
Espace	17.5	1.0	2.0	21.8	2607	62.0	23.6	
Astina	16.3	2.3	1.8	23.8	2387	60.9	**25.2**	
AVERAGE	18.0	1.2	2.7	22.4	2623	61.9	22.6	20.0
LSD (.05)	2.6	0.4	1.0	NA	NA	4.1	4.6	NA
CV	10.0	23.3	25.4	NA	NA	4.6	14.2	NA

* 1=No shatter, 5=Mostly shattered.
**1=No lodging, 5= >80% lodged.

Table 16. Field Pea Variety Trial - Harding County (Ralph), 1995-96.

Variety	Test Wt. Lb/Bu	Yield Bu/A 1996	Yield Bu/A 1994-96
Trapper	62.8	26.7	24.5
Arvika	64.0	25.8	27.6
Profi	60.5	27.1	25.0
Radley	61.6	17.0	16.8
AVERAGE	62.2	22.8	23.5
LSD (.05)	3.1	11.3	NA
CV	2.5	23.4	NA

Table 17. Field Pea Strip Trial - Perkins County (Bison), 1996.

Variety	Test Wt. Lb/Bu	Yield Bu/A
Arvika	61.5	19.5
Trapper	61.0	19.1
Radley	61.9	21.5
Profi	59.9	25.8
AVERAGE	61.1	21.5

PROSO MILLET VARIETY TRIAL

Objective: To evaluate standard and experimental proso millet varieties for yield, agronomic characteristics and adaptation to western South Dakota.

Procedure: This test was done in cooperation with Dr. David Baltensperger (millet breeder) and Glen Frickel from the University of Nebraska. Thirteen varieties were planted in a randomized complete block experiment with four replications near Martin and Wall, South Dakota. The millet was planted into 5' x 25' plots on June 3 (Wall) and June 10 (Martin), 1996 with a John Deere 610 plot drill with ten inch spacing. The ground was wheat (Martin) or fallow (Wall) the previous year and was sprayed with Roundup prior to planting. The Martin trial was harvested by Nebraska personnel with a small plot combine. The Wall location was hailed out. The results for Martin are presented in the table below.

Table 18. Proso Millet Variety Trial - Bennet County (Martin), 1995-96.

Variety	Height Inches	Seed Size Seeds/5g	Moisture Percent	Test Wt. Lb/Bu	Yield 1996	Lb/A 1995-96
Abarr	37	703	22	57.9	1680	1340
Cope	37	780	28	57.1	1250	1144
Dawn	27	731	15	57.8	1580	1097
Earlybird	30	705	21	56.3	1790	1647
Huntsman	33	744	28	58.1	1810	1591
Minco	35	752	18	58.3	1980	1583
Minsum	34	703	17	58.7	1720	1354
NE 1	31	807	23	58.2	1760	1673
Panhandle	37	744	18	58.3	1770	1359
Rise	33	756	21	57.9	2150	1775
Snowbird	34	762	19	58.1	1800	1398
Sunrise	31	717	22	57.5	1880	1782
Sunup	33	780	22	58.0	2270	1787
Average	33	745	21	57.9	1803	1502
LSD .05	4	31	4	0.8	31	

Discussion: The cooperation between the two Universities made this test possible. By SDSU personnel planting and University of Nebraska people harvesting, resources could be better utilized. It gave us a chance to look at new varieties and the Nebraska millet breeder a trial in an area where lots of millet is grown.

The trial did very well averaging 1800 Lb/A with good test weights. It was harvested a little early as is shown by the average moisture of 21 percent. Top yield group in this trial were Sunup, Rise, Minco and Sunrise. The best yielders over the past two years were Sunup, Sunrise, Rise and NE 1.

PHOSPHORUS STARTER FERTILIZER ON WINTER WHEAT

Objective: Evaluate the effect of different levels of phosphorus (P_2O_5) starter fertilizer on hard red winter wheat.

Procedure: Plots were seeded at seven locations in September 1995 with a John Deere 610 plot drill with ten inch spacing. All locations were planted into summer fallow and plots were soil sampled in October. Four levels of phosphorus and one check without fertilizer were planted in a four replication experiment. The granular fertilizer treatments were applied directly with the seed. The variety Arapahoe was planted at rate of 60 pounds per acre. Herbicides were applied in the fall or spring and varied according to weeds present. Visual stand ratings were taken in May and plots were trimmed to 5' x 25' after heading. The wheat was harvested in July and August with a Wintersteiger Nurserymaster Elite plot combine. Height, shatter and lodging notes were taken at the time of harvest.

Discussion: This experiment was planted beside the winter wheat variety trials at all CPT locations. Summaries of cultural practices and growing conditions can be found on pages 7 and 10. Many locations were abandoned as is noted in the table below. There was a 3½ to 5½ bushel response to phosphorus at Bison and Oelrichs in 1996 (Tables 19 & 20). There were no significant differences among the rates. At Martin the only difference was a slight decrease in yield at the high rate, with no difference between the other rates and the check. The averages over two years at all locations (Table 22) shows a three bushel advantage with the addtion of phosphorus starter.

Plots not Harvested

Location	Reason
Meade County - Bear Butte	Poor stands and hail
Butte County - Newell	Severe winterkill
Pennington County - Wall	Hail
Stanley County - Hayes	Winterkill and high winds

Table 19. Winter Wheat Phosphorus Starter - Bennett County (Martin) 1995-96.

Treatment Lb/A P_2O_5	Stand Percent	Height Inches	Test Wt. Lb/Bu	Yield Bu/A 1996	Yield Bu/A 1995-96
Check	55.0	34.0	60.7	52.1	58.5
25 # P2O5	47.5	33.0	60.2	54.4	62.9
50 # P2O5	46.3	33.0	60.2	50.7	61.5
75 # P2O5	42.5	32.5	60.4	50.8	61.5
100# P2O5	45.0	33.0	60.4	48.8	59.2
AVERAGE	47.3	33.1	60.4	51.3	60.7
LSD (.05)	6.7	1.3	0.9	7.9	
CV	9.2	2.6	1.0	10.0	

Soil Analysis	pH	Organic Matter %	Nitrogen Lb/A	Phosporus Lb/A	Potassium Lb/A
0 - 6"	6.6	2.2	32	59	2000
6 -24"			50		

Table 20. Winter Wheat Phosphorus Starter - Fall River County (Oelrichs) 1996.

Treatment Lb/A P_2O_5	Stand Percent	Height Inches	Test Wt. Lb/Bu	Yield Bu/A
Check	90.0	30.8	60.8	52.0
25 # P2O5	90.0	33.5	60.0	57.2
50 # P2O5	90.0	32.5	59.7	55.7
75 # P2O5	90.0	34.3	60.0	57.5
100 # P2O5	90.0	32.8	60.2	57.6
AVERAGE	90.0	32.8	60.1	56.0
LSD (.05)	NA	1.7	0.9	4.6
CV	NA	3.4	1.0	5.3

Soil Analysis	pH	Organic Matter %	Nitrogen Lb/A	Phosporus Lb/A	Potassium Lb/A
0 - 6"	7.2	1.7	26	34	2000
6 -24"			44		

Table 21. Winter Wheat Phosphorus Starter - Perkins County (Bison) 1995-96.

Treatment Lb/A P_2O_5	Stand Percent	Height Inches	Test Wt. Lb/Bu	Yield Bu/A 1996	Yield Bu/A 1995-96
Check	90.0	32.8	62.1	54.6	59.7
25 # P2O5	90.0	34.0	61.8	61.0	63.3
50 # P2O5	90.0	34.5	62.2	65.0	66.9
75 # P2O5	90.0	34.3	62.4	66.7	65.9
100 # P2O5	90.0	34.5	61.4	64.6	64.1
AVERAGE	90.0	34.0	62.0	62.4	64.0
LSD (.05)	NA	1.8	0.9	5.9	
CV	NA	3.5	0.9	6.1	

Soil Analysis	pH	Organic Matter %	Nitrogen Lb/A	Phosporus Lb/A	Potassium Lb/A
0 - 6"	6.4	1.8	35	40	970
6 -24"			67		

Table 22. Winter Wheat Phosphorus Starter - All West River Locations 1995-96.

Treatment Lb/A P_2O_5	Stand Percent	Height Inches	Test Wt. Lb/Bu	Yield Bu/A 1996	Yield Bu/A 1995-96
Check	86.1	34.3	60.0	52.9	51.3
25 # P2O5	85.3	35.0	59.7	57.6	54.6
50 # P2O5	85.1	34.8	60.0	57.1	54.7
75 # P2O5	84.7	34.9	60.0	58.3	54.9
100 # P2O5	85.0	35.1	59.8	57.0	53.4
AVERAGE	85.2	34.8	59.9	56.6	53.8

Chloride Rates on Arapahoe Winter Wheat Study, Wall SD, 1996

Cooperator: Rick Johnson of Quinn, SD

Objectives: To evaluate yield response of Arapahoe winter wheat to various levels of added chloride. To evaluate use of chloride to amend leaf spotting diseases of winter wheat.

Procedure: Soil samples were taken in early September to determine levels of chloride and other fertility levels of the experiment. Soil test results are listed in Table 23. The trial was planted with a JD610 drill on Sept. 26,95. Liquid starter fertilizer was applied at 6 gallons per acre. Seeding rate was at 950,000 seeds/acre. Four rates of chloride in the form of KCl were broadcast over the treated plots on April 9,96. A control was also implemented in the trial. The trial was harvested on July 31,96.

Results:

TABLE 23

Sample depth (inches)	O M (%)	Nitrate-N (ppm)	Olsen P (ppm)	K (ppm)	pH	Salts (mmho/cm)	Cl (ppm)	Texture
0-6	2.9	16.4	8	506	7.3	.50	2.00	fine
6-12	2.3	8.4	2	300	7.9	.50	2.00	fine
12-24	1.7	5.8	1	239	8.3	.50	1.25	fine

TABLE 24

Cl Rate	YIELD (Bu/A)	TEST WT. (#/Bu)	PLANT HT. (Inches)	Leaf Disease5 Rating (Flag leaf) (% infected)	(Flag leaf-1)* (% infected)
0	37.3	57.7	30.6	26	80
10	37.1	59.2	30.3	23	75
20	38.3	58.8	30.2	19	66
40	37.4	59.4	29.7	16	68
80	41.9	59.1	30.8	14	61
LSD(0.05) =	4.3	1.3	1.3	7.5	10.7
CV =	9.2	1.8	4.6	31.6	12.6

* = last leaf stage prior to flag leaf.
5 = Primarily tanspot as percent of leaf affected.
Soil test Cl lbs/a (0-2',0-3',0-4')=10,24,40. Soil series Ottumwa (from shale)

Discussion: The treatments were applied just prior to a very strong wind storm and it is the feeling of the researcher that some of this potassium chloride applied to the soil surface could have been blown away. The 80 pound per acre rate did show some yield increase in the 1996 trial. The trial was established on a field that tested low in chloride in the top 2 feet of soil. The study was established again in the fall of 1996 to be harvested in the summer of 1997. It is hoped that we will get more data from this experiment than the 1996 test that was subjected to strong winds. Results of the trial are listed in Table 24.

Chloride Winter Wheat Variety Study, Wall SD, 1996

Cooperator: Rick Johnson of Quinn, SD

Objectives: To evaluate yield response and quality of 15 varieties of winter wheat to chloride in soils that are known to be deficient. To evaluate use of chloride to amend leaf spotting diseases of winter wheat.

Procedure: Soil samples were taken in early September to determine levels of chloride and other fertility levels of the experiment. Soil test results are listed in Table 25. The trial was planted with a JD610 drill on Sept. 26,95. Liquid starter fertilizer was applied at 6 gallons per acre. Seeding rate was at 950,000 seeds/acre. Forty pounds of chloride in the form of Potassium Chloride was broadcast over the plots on April 9,96. The trial was harvested on July 31,96.

TABLE 25

Sample depth (inches)	O M (%)	Nitrate-N (ppm)	Olsen P (ppm)	K (ppm)	pH	Salts (mmho/cm)	Cl (ppm)	Texture (type)
0-6	2.9	16.4	8	506	7.3	.50	2.00	fine
6-12	2.3	8.4	2	300	7.9	.50	2.00	fine
12-24	1.7	5.8	1	239	8.3	.50	1.25	fine

TABLE 26

	YIELD (Bu/A)		TEST WT. (Lb/Bu)		PLANT HT. (Inches)	
Variety	With Cl	Without Cl	With Cl	Without Cl	With Cl	Without Cl
Abilene	43.7	43.8	58.6	60.6	26.3	25.3
Alliance	50.3	50.5	59.7	60.0	29.3	29.5
Arapahoe	47.7	46.6	59.1	59.1	31.3	31.3
Dawn	38.6	40.1	58.4	59.6	28.2	28.3
Elkhorn	49.9	48.2	57.1	58.1	36.7	37.0
Jagger	41.0	39.5	59.0	57.1	28.2	27.8
Kestrel	52.7	51.9	55.2	57.2	34.2	34.7
KS 2163	38.9	37.9	55.2	55.5	27.8	25.5
Nekota	50.3	50.0	59.3	60.0	29.3	28.3
Rose	48.5	49.9	58.4	58.5	33.5	33.0
Sage	46.0	45.9	59.4	59.2	32.2	32.7
SD 89119	46.4	47.0	58.9	59.4	31.5	31.0
Siouxland	40.8	40.4	55.2	56.2	32.8	31.5
TAM 1.07	45.3	43.2	57.8	57.8	28.3	27.2
Vista	43.0	45.3	59.2	58.8	28.2	27.0
LSD(0.05) =	1.92		0.85		1.01	
CV =	5.20		1.80		4.10	

Discussion: Fifteen winter wheat varieties were evaluated for their response to chloride fertilization during the summer of 1996. The wind blew very strong within 2 days after an application of 40 pounds per acre of chloride. The result during 1996 did not show any significant increases in yields. The trial was again established in the fall of 1996 and application of the chloride is planned for the spring of 1997. The interest was that there may be a difference in the response of the varieties to the chloride application.

Agrotain on Winter Wheat Study

Cooperator: Dave Finneman of Box Elder, SD

Objectives: To determine if there is a yield advantage to using Urea plus agrotain (a urease inhibitor) over Ammonium Nitrate or Urea by its self. The urease inhibitor slows the conversion of urea to ammonia.

Procedure: Winter wheat was planted under no-tillage conditions in the first week of November, 95. The fertilizers were all applied on April 9,96. The wheat was just sprouting at that time. One inch of rain was received within 24 hours after fertilizer application. Available Nitrate-N (0-2') was 93 lbs/acre for the growing wheat crop.

Results:

TABLE 27

N Rate	GRAIN YIELDS (Bu/Acre)				FORAGE YIELDS (Lbs/Acre)			
Lb/Acre	Am.Nitrate	Urea	Urea+Agrotain	Mean	Am.Nitrate	Urea	Urea+Agrotain	Mean
0	38	40	40	39	2267	1945	1828	2014
40	51	49	48	49	2661	2749	2588	2667
80	45	42	44	43	2735	2895	2983	2872
120	47	45	47	46	2808	2925	2969	2901
Mean	45	44	45		2618	2629	2592	

Discussion: Higher rates of nitrogen increased both forage and grain yields of winter wheat. Type of fertilizer used had no influence on either measurement. This result probably could have been expected because of rainfall received shortly after application. The rain water moved all of the nitrogen quickly into the soil and reduced the chance for volatilization to occur. Results of this trial are listed in Table 27.

SDSU REDUCED TILLAGE CROP ROTATION STUDY
HAYES, SOUTH DAKOTA 1996

Objectives: 1) To maintain at least 30% residue cover on the soil surface at all times. 2) Evaluate the net income from each rotation each year. 3) Evaluate changes in soil tilth, weeds present and disease occurence.

Experimental Design: The crop rotations include 5 cropping sequences which vary from 2 to 5 years in duration. The cropping sequences have been maintained from 1987 to 1996. The rotations are replicated 4 times in a randomized complete block design.

Funding: The South Dakota Wheat Commission, SDSU Agricultural Experiment Station and SDSU Cooperative Extension Service.

Cooperator: Bonnie Sivage of Hayes, South Dakota.

Rotations:

A **Winter Wheat / Fallow**

A combination of herbicides and tillage are being used to maintain a 30% soil residue cover.

B **WinterWheat / Millet**

A continuous cropping rotation planted no-till. This rotation provides excellent soil protection. Herbicides are used to control weeds.

C **Winter Wheat / Corn / Millet / Millet**

A continuous cropping system that includes 1 year of row crop and 3 years of small grains.

D **Winter Wheat / Safflower / Millet / Winter Wheat / Fallow to Safflower**

The longest rotation that includes no-tillage methods of growing small grains, oil-seed crops and a millet-crop.

E **Winter Wheat / Corn / Millet**

This 3 year rotation is continuous cropped. The rotation helps clean up cheatgrass infested fields.

Discussion of Hayes Rotations

1996 growing conditions:
The 1996 growing season really began in the fall of 1995 when the winter wheat was planted into the fallow and recropped millet stubble. There was limited fall growth of the winter wheat due to first dry and then cool and wet growing conditions. This provided limited protection for the fields from growing winter wheat. The extremely strong winds in the spring caused considerable soil erosion. The winter wheat planted into millet stubble had good protection. The winter wheat planted into fallow plots in the study had soil erosion even though the soil had over 30 percent ground cover in the fall after planting.

The fallow plots looked thin after the strong winds in the spring compared to the plots planted into millet stubble. The spring of 1996 was wet and it was difficult to plant the safflower and corn plots. The moist conditions after the strong winds allowed the thin winter wheat crop to develop a good root system and have strong yields. The millet planting was accomplished on June 4, 1996 into good soil conditions. The millet yields were good at 40 bushels per acre. The corn yields were lower due to dry weather in late summer.

This is the last season we will have the rotation study at Hayes and the data will be summarized over the past 6 years. I feel we have very good data on cost of production because we recorded each field operation as well as crop yields.

Discussion of Rotation A:

The Winter Wheat / Fallow rotation has been used as the standard rotation to compare all other rotations to from 1987 to the present. Over the years, this has been the most consistent rotation in the study. It has not always been the most profitable but the 6 year average income of 43.98 dollars per acre has been very consistent. The rotation has not always used all the available moisture because the last 4 years of the study were above normal precipitation. We had many fall seasons when the sub-soil was wet to 5 and 6 foot.

Discussion of Rotation B:

The Winter Wheat / Millet rotation has had no tillage from 1987 through 1996. It was the most profitable rotation over the past 6 years with an average income of 59.21 dollars per acre. The only net loss of 12.06 dollars per acre in this rotation was during 1994 when the millet plots were planted in May and the foxtail grasses took over the plots so we summer fallowed them. The next summer we had an above normal winter wheat crop and rotation B made the most money at 91.19 dollars per acre. The stands of millet planted no-till into winter wheat stubble are not as good as millet planted into soil with less residue. However, by the fall the weaker stands generally had similar yields to the better stands. The winter wheat planted into the millet stubble always had excellent winter survival. The winter wheat on millet stubble averaged about 80 percent of the winter wheat yields planted on summer fallow. This would be a good rotation to use to replace summer fallow. However, the use of other crops in the rotation in addition to millet would give greater benefits for weed control and reduction in wheat diseases.

Discission of Rotation C:

The Winter Wheat / Com / Millet / Millet or Barley rotation was more diverse and intensive than all other rotations in the study. There was no fallow in this rotation and so all the precipitation was used and generally the sub-soil was dry after the com crop. For this reason the millet was grown after the com crop to allow the sub-soil to recharge with moisture. The second millet crop was used due to difficulty in getting the barley crop planted in a timely manor. The net income from this rotation varied from a positive 100.76 dollars per acre to a loss of 9.16 dollars per acre. The 6 year average was slightly better than the winter wheat / fallow rotation at 46.16 dollars per acre. I feel the income from this rotation could be improved by growing two wheat crops and increasing the wheat portion of the rotation to 50 percent. The three years out of wheat did give us a slight yield advantage to the winter wheat crop when compared to the winter wheat / millet rotation. In a dry season the millet portion of this rotation could be replaced with summer fallow.

Discussion of Rotation D:

The Winter Wheat / Safflower or Sunflower or Com / Millet / Winter Wheat / Fallow rotation I feel has a lot of potential for western South Dakota. The rotation originally used grain sorghum in place of the safflower. The grain sorghum had extremely low yields in 1992 and 1993 and at that time we changed the rotation to com and the last 2 years we have used safflower. The rotation had the highest return in 1996 with 95.10 dollars per acre. The safflower crop was introduced because the safflower has a very deep rooting system removing moisture to a depth of 7 foot. This is moisture and nitrogen that winter wheat would never use. The safflower crop has the potential of reducing saline seeps by removing deep sub-soil moisture. The problem safflower has in central South Dakota is that August rains and foggy weather will reduce yields because leaf spotting diseases will infest the leaves and bolls. The safflower crop has good yield potential when there have been moist growing seasons in prior years. During dry periods the safflower could be dropped from the rotation. This rotation makes use of cool and warm season crops as well as different rooting depths. The winter wheat grown after the fallow had and average of almost 5 bushels per acre more than the wheat crop grown in the winter fallow rotation.

Discussion of Rotation E:

The Winter Wheat / Com / Millet is a rotation that has potential for the livestock producer because it produces both grain and forage that could be consumed by livestock. The rotation had a very poor return in 1992 and 1994 when grain sorghum was frozen before it was mature. The com is better at emergence from cool soils than the sorghum. Originally the rotation included a fallow season in place of the millet. It was determined that the past 2 years the soil profile had adequate moisture to grow the millet crop with little if any reduction in the yields of the winter wheat. The millet was also a very low cost crop to grow after the 2.5 pounds of atrazine were applied prior to the com crop. There was no evidence of carry over of the atrazine after either the fallow or millet crop. Winter wheat yields have been excellent in this rotation. The net income of 44.49 dollars per acre on a 6 year average was comparable to the winter wheat / fallow rotation.

1996 YIELDS

Rotation	Crop	Yield Bu/A	Crop	Yield Bu/A	Crop	Yield Bu/A	Crop	Yield Bu/A	Crop	Yield Bu/A
A	W.Wheat	56.2	Fallow							
B	W.Wheat	45.7	Millet	35.6						
C	W.Wheat	50.4	Corn	59.0	Millet-a	46.9	Millet-b	40.1		
D	W.Wheat	56.9	Saff.	32.3	Millet	42.8	W.Wheat	48.5	Saff.	25.0
E	W.Wheat	42.9	Corn	59.1	Millet	46.5				

Rotation A

WINTER WHEAT / SUMMER FALLOW

Cost / A.	1996 WinterWheat
15.53	-Plant to Nekota at 1 bu/A seeding rate. Seed treated w/1 oz Gaucho, Thiram, & Vitavax. No starter fertilizer added. Planted w/JD610 drill. 12" row spacing - Sept 13, 95
.40	-Soil Sampling & Analysis - Dec.14, 95
8.20	-Sprayed on 20#/A Nitrogen in form of liquid 28-0-0 - March 21, 96
5.92	-Spray w/.1 oz Ally + LV6 @ 5.3 oz/A 8 gal/A rate - June 4, 96
19.24	-Harvest 56.2 bu Winter wheat - July 29, 96 Test weight - 61.6#/bushel
17.00	-Land Charges 1996
66.29	Total Cost of Winter Wheat Production

Rotation A

WINTER WHEAT / SUMMER FALLOW

Cost / A	1996 Summer Fallow
11.91	-Spray w/16 oz RT w / Additives (Ammonium Sulfate, X-77) + 1# ai Aatrex 8 gpA rate. August 31, 95
7.31	-Spray w/12 oz RT+ AmSul granules (75 grams/gal) + Penetrate 15 ml/gal 8 gpA spray rate. April 24, 96
4.00	-Under-cut w/ 24" wide sweeps - June 20, 96
4.00	-Under-cut w/ 24" wide sweeps - July 9, 96
17.00	-Land Charges 1996
44.22	Total Cost of Summer Fallow

Rotation A SUMMARY 1996

Income		Expenses	
		66.29	Cost of Winter Wheat Crop
248.97	Sale of Winter Wheat	44.22	Cost of Fallow
248.97	Total Income	110.51	Total Cost of Production

$ 69.23 (1996) Income per acre
$ 43.98 (6 yr. ave.) Income per acre

Rotation B

WINTER WHEAT / MILLET

Cost / A	1996 Winter Wheat
11.17	-Spray w/16 oz RT + Additives (Ammonium Sulfate, X-77) + 4 oz Banvel on Aug. 31, 95
16.13	-Plant to Nekota 75#/A No starter fertilizer added. Planted w/JD750 drill. 10" row spacing Sept.27, 95
.40	-Soil Sampling & Analysis - Dec.14, 95
18.60	-Sprayed on 60#/A Nitrogen in form of liquid 28-0-0 - March 21, 96
5.92	-Spray w/ 1 oz Ally + LV6 @ 5.3 oz/A 8 gal/A rate - June 4, 96
17.14	-Harvest 45.7 bu Winter wheat - July 29, 96 Test weight - 61.7#/bushel
17.00	-Land Charges 1996
86.36	Total Cost of Winter Wheat Production

Rotation B

WINTER WHEAT / *MILLET*

Cost / A	1996 Millet
11.91	-Spray w/16 oz RT w / Additives (Ammonium Sulfate, X-77) + 1# ai Aatrex 8 gpA rate. August 31, 95
.40	-Soil Sampling & Analysis - Dec.14, 95
7.31	-Spray w/ 12 oz RT+ AmSul granules (75 grams/gal) + Penetrate (15 ml/gal) 8 gpA rate. April 24, 96
19.22	-Plant to Sunrise millet at 20#/A, plus 6 gal/A 10-34-0 w/JD 610 drill 10" row spacing. - June 4, 96.
15.12	-Harvest 1780# Millet - Aug.28, 96 Test weight 58.1#/bushel
17.00	-Land Charges 1996
70.96	Total Cost of Millet Production

Rotation B SUMMARY 1996

Income		Expenses	
202.45	Sale of Winter Wheat	86.36	Cost of Winter Wheat Crop
106.80	Sale of Millet	70.96	Cost of Millet Crop
309.25	Total Income	157.32	Total Cost of Production

$ 78.66 (1996) Income per acre
$ 59.21 (6 yr. ave.) Income per acre

Rotation C

WINTER WHEAT / CORN / MILLET-A / MILLET-B

Cost / A.	1996 Winter Wheat
11.17	-Spray w/16 oz RT + Additives (Ammonium Sulfate, X-77) + 4 oz Banvel on Aug. 31, 95
16.13	-Plant to Nekota 75#/A No starter fertilizer added. Planted w/JD750 drill. 10" row spacing Sept.27, 95
.40	-Soil Sampling & Analysis - Dec.14, 95
18.60	-Sprayed on 60#/A Nitrogen in form of liquid 28-0-0 - March 21, 96
5.92	-Spray w/.1 oz Ally + LV6 @ 5.3 oz/A 8 gal/A rate - June 4, 96
18.08	-Harvest 50.4 bu Winter Wheat - July 29, 96 Test weight - 61.9#/bushel
17.00	-Land Charges 1996
87.30	Total Cost of Wheat Production

Rotation C

WINTER WHEAT / *CORN* / MILLET-A / MILLET-B

Cost / A	1996 Corn
12.36	-Spray w/ 2 1/2# ai Aatrex(90df) + 1 qt/A Crop Oil (10 gal/A rate) on Aug.31, 95
.40	-Soil Sampling & Analysis - Dec.14, 95
14.70	-Sprayed on 45#/A Nitrogen in form of liquid 28-0-0 - March 21, 96
37.20	-Plant to Dekalb 401 (DK 401) corn 24"row spacing, 13" seed spacing. (90 day maturity) with JD750 Kinze drill 20,000 seeds/A plus 6 gal/A 10-34-0 Starter Fert. - May 2, 96
23.87	-Spray w/Accent 2/3 oz /Acre + Buctril @ 4 oz ai/A (12 oz product/A)+ Crop oil @ 2 pints/Acre 8 gal/A spray rate - June 20, 96
19.80	-Harvest 59.0 bu/A Corn - October 10, 96 Test weight 56.0#/bushel
17.00	-Land Charges 1996
125.33	Total Cost of Corn Production

Rotation C

WINTER WHEAT / CORN / *MILLET-A* / MILLET-B

Cost / A	1996 Millet-a
.40	-Soil Sampling & Analysis - Dec.14, 95
10.80	-Sprayed on 30#/A Nitrogen in form of liquid 28-0-0 - March 21, 96
7.31	-Spray w/ 12 oz RT + AmSul granules (75 grams/gal) + Penetrate (15 ml/gal) 8 gpA rate. April 24, 96
8.48	-Sprayed w/12 oz Roundup Ultra + AmSul @ 50 ml/gal + 2 oz Banvel/A 8 gpA rate on June 4, 96
19.22	-Plant to Sunrise millet at 20#/A, plus 6 gal/A 10-34-0 w/JD 610 drill 10" row spacing. - June 4, 96.
17.38	-Harvest 2345# millet - August 28, 96 Test weight 57.0# / bushel
17.00	-Land Charges 1996
80.59	Total Cost of Millet-a Production

Rotation C

WINTER WHEAT / CORN / MILLET-A / *MILLET-B*

Cost / A	1996 Milet-b
11.51	-Spray w/ 16 oz RT + AmSul + X-77 + 1# ai Aatrex(90df)/A 8 gpA rate on Aug. 31, 95
.40	-Soil Sampling & Analysis - Dec.14, 95
14.70	-Sprayed on 45#/A Nitrogen in form of liquid 28-0-0 - March 21, 96
8.48	-Sprayed w/12 oz Roundup Ultra + AmSul @ 50 ml/gal + 2 oz Banvel/A 8 gpA rate on June 4, 96
19.22	-Plant to Sunrise millet at 20#/A, plus 6 gal/A 10-34-0 w/JD 610 drill 10" row spacing. - June 4, 96.
16.02	-Harvest 2004#/A millet - August 28, 96 Test weight 57.0# / bushel
17.00	-Land Charges 1996
87.73	Total Cost of Millet-b Production

Rotation C SUMMARY 1996

Income		Expenses	
223.27	Sale of Winter Wheat	87.30	Cost of Winter Wheat Crop
147.50	Sale of Corn	125.33	Cost of Corn Crop
140.70	Sale of Millet-a	80.59	Cost of Millet-a Crop
120.24	Sale of Millet-b	87.73	Cost of Millet-b Crop
631.71	Total Income	380.95	Total Cost of Production

$ 62.69 (1996) Income per acre
$ 46.16 (6 yr. ave.) Income per acre

Rotation D

***WINTER WHEAT-A* / SAFFLOWER-A / MILLET / WINTER WHEAT-B / FALLOW TO SAFFLOWER-B**

Cost / A.	1996 Winter Wheat-a
15.53	-Plant to Nekota at 1 bu/A seeding rate. Seed treated w/1 oz Gaucho, Thiram, & Vitavax. No starter fertilizer added. Planted w/JD610 drill. 12" row spacing - Sept 13, 95
.40	-Soil Sampling & Analysis - Dec.14, 95
5.92	-Spray w/ 1 oz Ally + LV6 @ 5.3 oz/A. 8 gal/A rate - June 4, 96
19.38	-Harvest 56.9 bu/A. Winter wheat (**Note:** This soil fallowed in 1995.) Test Weight 61.4#/bushel
17.00	-Land Charges 1996
58.23	Total Cost of Winter Wheat-a production

Rotation D

WINTER WHEAT-A / *SAFFLOWER-A* / MILLET / WINTER WHEAT-B / FALLOW TO SAFFLOWER-B

Cost / A.	1996 Safflower-a
8.97	-Spray w/16 oz RT w/additives(AmSul,A-90) + 21.3 oz LV6/A - Aug.31, 95
12.20	-Apply TR-10 granules @ 1# ai/Acre & incorporate w/24" wide sweeps - Oct.18, 95
.40	-Soil Sampling & Analysis - Dec.14, 95
4.00	-Disk to final incorporate TR:10 granules. - Apr.10, 96
27.47	-Seed to S-541, 25# / Acre, 20" rows, 6 gal/A 10-34-0 w/JD610 drill - April 24, 96
21.71	-Spray w/ .1 oz Ally + 2 1/4 pints Poast Plus + 2 pints Crop Oil/A (**Note:** This herbicide recipe is for research purposes only and is not labeled in the State of South Dakota.)
14.47	-Harvest 1293#/A safflower - Sept. 3, 96 Test weight 37.4#/bushel
17.00	-Land Charges 1996
106.22	Total Cost of Safflower-a Production

Rotation D

WINTER WHEAT-A / SAFFLOWER-A / *MILLET* / WINTER WHEAT-B / FALLOW TO SAFFLOWER-B

Cost / A.	1996 Millet
.40	-Soil Sampling & Analysis - Dec.14, 95
7.31	-Spray w/ 12 oz R T + AmSul granules (75 grams/gal) + Penetrate (15 ml/gal) 8 gpA rate. April 24, 96
18.60	-Spray on 60# N in form of liquid 28-0-0 - May 23, 96
19.22	-Plant to Sunrise millet at 20#/A, no starter fertilizer, w/JD610 drill 12" row spacing - May 31, 96
16.57	-Harvest 2142# millet / Acre - August 28, 96 Test weight 57.9# / bushel
17.00	-Land Charges 1996
79.10	Total Cost of Millet Production

Rotation D

WINTER WHEAT-A / SAFFLOWER-A / MILLET / *WINTER WHEAT-B* / FALLOW TO SAFFLOWER-B

Cost / A	1996 Winter Wheat-b
11.17	-Spray w/16 oz RT + Additives (Ammonium Sulfate, X-77) + 4 oz Banvel on Aug. 31, 95
16.13	-Plant to Nekota 75#/A No starter fertilizer added. Planted w/JD750 drill. 10" row spacing Sept.27, 95
.40	-Soil Sampling & Analyses - Dec.14, 95
18.60	-Sprayed on 60#/A Nitrogen in form of liquid 28-0-0 - March 21, 96
5.92	-Spray w/.1 oz Ally + LV6 @ 5.3 oz/A 8 gal/A rate - June 4, 96
17.70	-Harvest 48.5 bu Winter Wheat - July 29, 96 Test weight - 61.8#/bushel
17.00	-Land Charges 1996
86.92	Total Cost of Winter Wheat-b Production

Rotation D

WINTER WHEAT-A / SAFFLOWER-A / MILLET / WINTER WHEAT-B / *FALLOW TO SAFFLOWER-B*

Cost / A	1996 Fallow to Safflower-b
11.91	-Spray w/16 oz/A RT + additives (AmSul, A-90) + 1# ai Aatrex 8 gpa rate. - Aug. 31, 95 (**Note:** This herbicide recipe is for research purposes only and is not labeled in the State of South Dakota.)
.40	-Soil Sampling & Analysis - Dec.14, 95
7.31	-Spray w/ 12 oz RT + AmSul granules (75 grams/gal) + Penetrate (15 ml/gal) 8 gpA rate. April 24, 96
27.47	-Seed to S-541, 25# / Acre, 20" rows, 6 gal/A 10-34-0 w/JD610 drill - April 24, 96
21.71	-Spray w/ .1 oz Ally + 2 1/4 pints Peast Plus + 2 pints Crop Oil/A (**Note:** This herbicide recipe is for research purposes only and is not labeled in the State of South Dakota.)
12.99	-Harvest 998#/A safflower - Sept. 3, 96 Test weight 37.6#/bushel
17.00	-Land Charges 1996
98.79	Total Cost of Safflower-b Production

Rotation D SUMMARY 1996

Income		Expenses	
252.07	Sale of Winter Wheat-a	58.23	Cost of Winter Wheat-a Crop
214.86	Sale of WinterWheat-b	86.92	Cost of Winter Wheat-b Crop
128.52	Sale of Millet	79.10	Cost of Millet Crop
174.56	Sale of Safflower-a	106.22	Cost of Safflower-a Crop
134.73	Sale of Safflower-b	98.79	Cost of Fallow to Safflower-b Crop
904.74	Total Income	429.26	Total Cost of Production

$ 95.10 (1996) Income per acre
$ 46.09 (6 yr. ave.) Income per acre

Rotation E

WINTER WHEAT **/ CORN / MILLET**

Cost / A.	1996 Winter Wheat
11.17	-Spray w/16 oz RT + Additives (Ammonium Sulfate, X-77) + 4 oz Banvel on Aug. 31, 95
16.13	-Plant to Nekota 75#/A No starter fertilizer added. Planted w/JD750 drill. 10" row spacing Sept.27, 95
.40	-Soil Sampling & Analysis - Dec.14, 95
18.60	-Sprayed on 60#/A Nitrogen in form of liquid 28-0-0 - March 21, 96
5.92	-Spray w/.1 oz Ally + LV6 @ 5.3 oz/A 8 gal/A rate - June 4, 96
16.58	-Harvest 42.9 bu/A Winter wheat - July 29, 96 Test Weight 62.2#/bushel
17.00	-Land Charges 1996
85.80	Total Cost of Wheat production

Rotation E

WINTER WHEAT / ***CORN*** **/ MILLET**

Cost / A.	1996 CORN
12.36	-Spray w/ 2 1/2# ai Aatrex(90df) + 1 qt/A Crop Oil (10 gal/A rate) on Aug.31, 95
.40	-Soil Sampling & Analysis - Dec.14, 95
37.20	-Plant to Dekalb 401 (DK 401) corn 24"row spacing, 13" seed spacing (90 day maturity) with JD750 Kinze drill 20,000 seeds/A plus 6 gal/A 10-34-0 Starter Fert. - May 2, 96
23.87	-Spray w/Accent 2/3 oz /Acre + Buctril @ 4 oz ai/A + Crop oil @ 2 pints/'Acre - 8 gal/'A spray rate June 20, 96
19.82	-Harvest 59.1 bu/A Corn - Oct.10, 96 Test weight 56.0#/bushel
17.09	-Land Charges 1996
110.65	Total Cost of Corn Production

Rotation E

WINTER WHEAT / CORN / ***MILLET***

Cost / A.	1996 MILLET
.40	-Soil Sampling & Analysis - Dec.14, 95
8.48	-Sprayed w/12 oz Roundup Ultra + AmSul @ 50 ml/gal + 2 oz Banvel/A 8 gpA rate on June 4, 96
19.22	-Plant to Sunrise millet at 20#/A, plus 6 gal/'A 10-34-0 w/JD 610 drill 10" row spacing. - June 4, 96
17.29	-Harvest 2323#/A millet - August 28, 96 Test weight 57.3# / bushel
17.00	-Land Charges 1996
62.39	Total Cost of Millet Production

Rotation E SUMMARY 1996

Income		Expenses	
190.05	Sale of Winter Wheat	85.80	Cost of Winter Wheat Crop
147.75	Sale of Corn	110.65	Cost of Corn Crop
139.38	Sale of Millet	62.39	Cost of Millet Crop
477.18	Total Income	258.84	Total Cost of Production

$ 72.78 (1996) Income per acre
$ 44.54 (6 yr. ave.) Income per acre

Long-Term Average Economic Returns

Rotation	1996	3 yr ave. (1994-96)	6 yr ave. (1991-96)
A	$69.23	$45.39	$43.98
B	78.66	52.39	59.21
C	62.69	35.17	46.16
D	95.10	49.16	46.09
E	72.51	49.88	44.49

Hayes Rotation (Kirley) Total Rain-Fall Data (1996)

Total Precip.(inches)		Total Precip.(inches)	
March	.81	July	1.96
April	1.09	August	1.01
May	6.35	September	4.63
June	1.41	October	3.13

(Accumulative total precipitation from March 1 to October 31,96 is 20.39")

Hayes Rotation (Kirley) Total Useable Rain-Fall Data (1996)

(Precipitation in excess of .25" per rainfall period)

Useable Precip.(inches)		Useable Precip.(inches)	
March	.28	July	.86
April	.59	August	.59
May	5.26	September	3.87
June	.35	October	2.12

(Accumulative useable precipitation from March 1 to October 31,96 is 13.92")

COST OF INPUTS - 1996

SEED

Nekota Winter Wheat....$6.50/Bu
Sunrise Millet..... .15/#
DK 401 Corn..... 83.90/Bu (80,000 kernels)
S-541 Safflowers..... 22.50/50#

LIQUID FERTILIZERS

10-34-0.....$235/Ton ($1.37/gal)
28-0-0..... 145/Ton ($ .78/gal)

HERBICIDES

(From Warne Chem. Nov.14,96)

Roundup RT.....	$37.20/gal
Roundup Ultra.....	40.41/gal
X-77 (Surfactant).....	16.50/gal
Ammonium Sulfate.(liq).....	4.22/gal
Ammonium Sulfate(Gran)..	11.59/50lb
Atrazine 90df.....	2.91/lb
Crop Oil.....	4.50/gal
Buctril.....	56.75/gal
Accent.....	26.40/oz
Ally.....	21.13/oz
Treflan 10% granules.....	.82/lb
Poast Plus.....	55.00/gal
LV6 (2,4D Ester).....	19.58/gal
Banvel.....	78.93/gal

SEED TREATMENTS

Vitavax/Thiram/RTU.....$33.41/gal
(5 oz/100# seed)
Seed treatment fee.....$ .25/Acre

NO-TILL PLANTING CHARGES

$8.00/Acre

LAND CHARGES

$17.00/Acre

SPRAY APPLICATION FEE

$3.00/Acre

HARVEST CHARGES

Base is $12/A @ 20 bushels.
$.20/Bu for yields above 20 bushels

GRAIN SALE VALUES

(Hi + Low/2 from July 15-Nov 1,96
at Dakota Mill & Grain,Rapid City)

Winter Wheat-11.6% pro...	$4.43/bu
Corn #2 yellow.....	2.50/bu
Proso Millet.....	6.00/cwt
Safflowers (oil-type).....	13.50/cwt

SOIL SAMPLING & ANALYSIS

$.40 / Acre

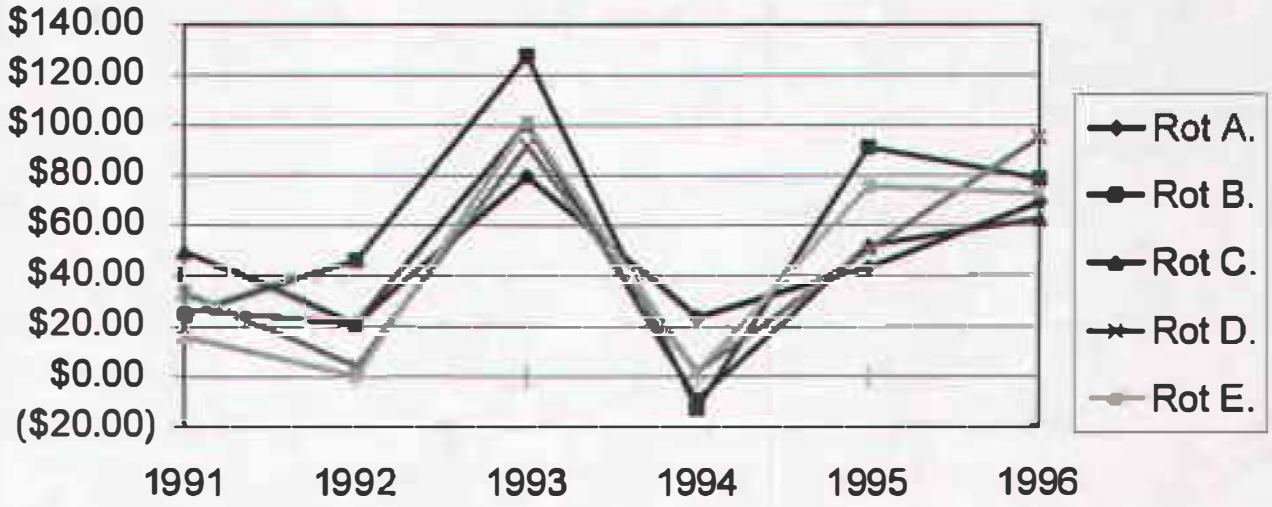
MECHANICAL TILLAGE CHARGE

$4.00/Acre

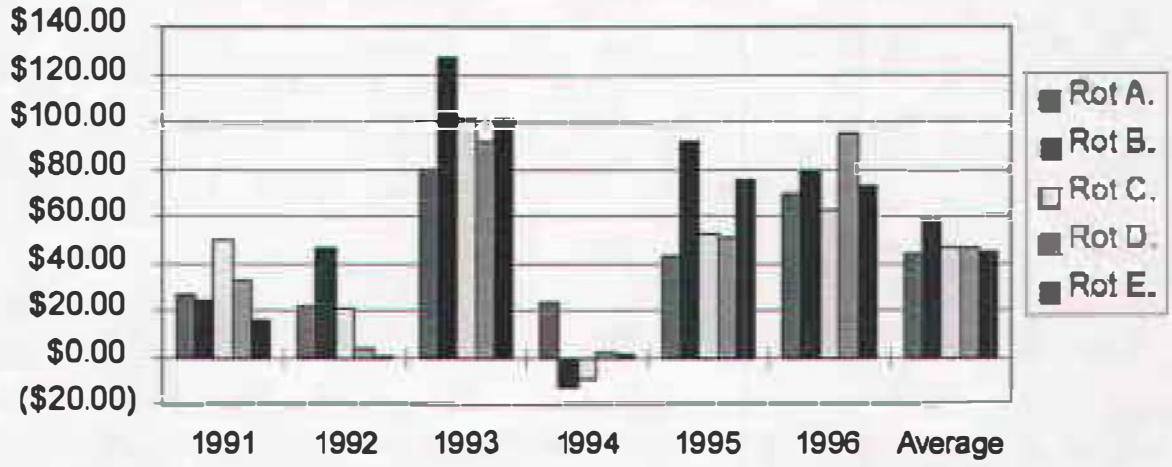
Net Income per Acre, Hayes Rotation 1991-96

Year	Rot A.	Rot B.	Rot C.	Rot D.	Rot E.
1991	$26.66	$24.55	$49.52	$33.05	$15.76
1992	$21.36	$46.07	$21.17	$4.19	$0.50
1993	$79.68	$127.46	$100.76	$91.81	$101.05
1994	$23.70	(-$12.66)	(-$9.16)	$2.01	$1.49
1995	$43.24	$91.19	$51.98	$50.37	$75.64
1996	$69.23	$78.66	$62.69	$95.10	$72.78
Average	$43.86	$59.21	$46.16	$46.09	$44.64

Net Income per Acre, Hayes Rotation 1991-96



Net Income per Acre, Hayes Rotation 1991-96



SDSU REDUCED TILLAGE CROP ROTATION STUDY
WALL, SOUTH DAKOTA 1996

Objectives: To evaluate the economic returns from the total crop rotation each year.

Funding: The South Dakota Oil Seeds Council and the South Dakota Wheat Commission have shared the funding on this crop rotation study.

Cooperator: Crown Partnership of Wall, South Dakota.

Procedures: The study with the 11 different rotations was established in the spring of 1994. The rotations are 2 to 4 years in duration and we will be completing one cycle in 1998. All the crops in each rotation are grown each year and the rotations are replicated 4 times at this location. Reduced and no-till production practices are used to grow the crops in the rotations. The corn, millet, peas, spring wheat and winter wheat were planted no-till into millet stubble. The safflower and sunflower plots had 1 fall and 1 spring tillage to incorporate the treflan herbicide. The crop yields were taken from each plot and used to compute the average yields for each rotation. The crop yields are beginning to reflect the effects of the rotations and the data is becoming more meaningful each season. Detailed field notes are recorded for each rotation and used in calculating the cost of production. An economic return is calculated for each season as well as long term averages.

Rotations and Crop Yields:

1	Winter Wheat 30.0bu	/	Fallow		
2	Winter Wheat 34.6bu	/	Sunflower 1063 lbs	/	Millet 1829 lbs
3	Winter Wheat 32.0 bu	/	Safflower 1366lbs	/	Millet 1998 lbs
4	Winter Wheat 26.9bu	/	Millet 2063lbs		
5	Winter Wheat 22.4bu	/	Sunflower 996 lbs	/	Spring Wheat 32.1 bu
6	Winter Wheat 15.4 bu	/	Safflower 1316 lbs	/	Spring Wheat 34.0 bu
7	Winter Wheat 37.3 bu	/	Corn 58.9 bu	/	Fallow
8	Winter Wheat 39.4 bu	/	Sunflower 843lbs	/	Clover Fallow
9	Winter Wheat 33.0 bu	/	Safflower 1313 lbs	/	Clover Fallow
10	Winter Wheat 30.1 bu	/	Peas 1290 lbs	/	Millet 2266 lbs
11	Winter Wheat 35.8 bu	/	Corn 54.1 bu	/	Millet 1920lbs

Rotation # 1: Winter Wheat / Fallow
The economic comparisons show a large change from 1995 to 1996 in the net return. The 1995 winter wheat crop planted on fallow had an excellent yield of 67.7 bushels per acre and the wheat was marketed for $4.46 per bushel. The 1996 crop planted on summer fallowed plots had an average yield of 30 bushels per acre. The reduction in yield of the 1996 crop was due the strong winds that occured in the early spring of 1996.

Rotation # 2: Winter Wheat / Sunflower / Millet
This is a very intensive rotation with a diversity of crops and would provide an excellent opportunity for reduction in weed and diseases. The rotation did not have a very good economic return over the past 2 seasons. This was due last year to low millet yields and low sunflower yields. The stand of sunflower was destroyed in 1995 by cutworms and 1996 there was a problem with sunflower emergence and stand. The sunflower crop has a higher yield potential than we have been getting. Therefore We hope to improve the economics of this rotation in the future.

Rotation # 3: Winter Wheat / Safflower / Millet:
This rotation provides an excellent diversity in the type of crops grown. It has a cool season grass (winter wheat), a warm season broadleaf(safflower) and a warm season grass(millet). The rooting depth of the crops range from the shallow rooted millet(18 inches) to the deep rooted safflower(84 inches). The 2 warm season crops are more drought tollerant and the winter wheat makes most of its growth during the cool portion of the summer. This crop rotation will make full use of all precipitation received. The winter wheat was planted no-till into the millet stubble and has had excellent winter survival and wind protection. The millet was planted no-till into the safflower stubble and had an excellent stand due to limited amount of residue present at planting time. The safflowers had to be replanted in 1995 because of crusting of the soil after planting and the yields were lower (905 pounds / acre) as a result of it. The safflower yields in 1996 averaged over 1,300 pounds / acre. During dry seasons a summer fallow treatment could be used to replace the millet crop. This rotation had the highest net return in 1996 and has been a consistant money maker during 1995 and 1996.

Rotation # 4: Winter Wheat / Millet
This is a continuous no-till crop rotation alternating between winter wheat and millet. The millet crop is a good replacement for summer fallow. There has been some difficulty in the establishment of a good stand of millet after a high yielding winter wheat crop due to large amounts of residue present on the soil surface. The winter wheat yields in the past have averaged about 80 percent of the fallow planted winter wheat yields. This is a short rotation and would not do much more than winter wheat fallow to control weeds or diseases. The rotation is a consistant money maker partly due to low cost of producing the millet crop.

Rotation # 5: Winter Wheat / Sunflower / Spring Wheat:
This rotation had positive net income in 1996 even though the winter wheat planted into spring wheat stubble had a very low yield of 15.4 bushels per acre. This low yield was due the increase in downy bromegrass in the winter wheat. The increase in the downy bromegrass weed species was due to the no-till planting of winter wheat into spring wheat stubble. This rotation has been changed for 1997 to a 4 year rotation winter wheat / corn / sunflower / spring wheat. This will allow two years out of wheat to clean up the downy bromegrass problem.

Rotation # 6: Winter Wheat / Safflower / Spring Wheat
This rotation had the same downy bromegrass problem as rotation 5. It has been changed for 1997 to winter wheat / safflower / peas / winter wheat. The rotation should work well for seeding the peas early into the safflower stocks. The peas should provide an excellent seed-bed for planting the winter wheat into in the fall. It will be interesting to see how the rotations with two years in wheat and two out of wheat will work for diseases and weed problems. The spring wheat after safflower looked very nice and we expected a better yield than 34 bushels per acre.

Rotation # 7: Winter Wheat / Corn / Fallow
The corn planted no-till in this rotation had an average yield of 58.9 bushels per acre. The corn yields were very close to expected yields for this area of the state. The winter wheat yields were lower than expected at 37 bushels per acre due to the strong winds that damaged the plots in the spring of 1996. The winter wheat yields in 1995 were excellent at 69 bushels per acre. The economic return in 1995 was $85.59 per acre and this was the highest in the study. This rotation is less intensive with a fallow period every three years.

Rotation # 8: Winter Wheat / Sunflower / Clover Fallow
This rotation makes use of a clover crop during the early portion of the fallow season to provide some nitrogen and organic matter to the soil. The clover is planted during the season the sunflower crop is growing. The stand of sweet clover has not been good for the past two years. The net return from this rotation was only $ 4.42 per acre in 1996. The plots contained in this rotation will be used to make rotations 5,6 and 9 longer rotations.

Rotation # 9: Winter Wheat / Safflower / Clover Fallow
The winter wheat in this rotation was slow to start in the spring and had some wind damage to the plots. The winter wheat had an average yield of 33 bushels per acre. This is lower than expected and similar in yield to the plots recropped into millet stubble. The safflower plots had a good yield of 1313 pounds per acre. In an effort to increase the profit of this rotation we will add one more year of wheat production in 1997. The new rotation will give us 2 years of wheat production and two years out of wheat production.

Rotation # 10: Winter Wheat / Field Pea / Millet
The field pea in this rotation could be planted early in the spring into the wheat stubble and be harvested by mid July. The field pea yields were at 21.5 bushels this last year. Field peas when mature lay on the soil and will require lifters to harvest the crop. The pea portion of this rotation were previously flax. Flax yields were poor at 6.2 to 11.2 bu/'A. Peas are responding more favorable agronomically than the flax did.

Rotation # 11: Winter Wheat / Corn / Millet
The winter wheat had an excellent yield of 35 bushels per acre planted back into millet stubble. The corn had an average yield of 54 bushels per acre but did not make very much money because of the high cost of weed control and fertilizer. The millet had a yield of 40 bushels per acre with a low cost of production and actually made more money than the corn crop. The millet was planted no-till into the corn stalks and had an excellent stand early in the season. The millet crop responds to a warm black soil in the early summer.

Rotation 1

WINTER WHEAT / SUMMER FALLOW

Cost / A	1996 Winter Wheat
25.57	-Plant to Nekota(75#/A rate)w/610 drill at 12" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax, thiram, RTU on Sept.26,95
.40	-Soil Sampling - Dec.7,95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer on dormant winter wheat at 60#N / Acre rate. - March 20,96
6.20	-Spray w/LV6 @ 8 oz product (6 oz ai)/acre plus 2 gal/A 32-0-0 8 gpa rate. - May 21,96
14.00	-Harvest 30.0 bu winter wheat - July 22,96 Test weight - 61.8# / bushel
23.00	-Land Charges 1996
87.77	Total Cost of Winter Wheat Production

Rotation 1

WINTER WHEAT / *SUMMER FALLOW*

Cost / A.	1996 Summer Fallow
10.83	-Spray w/Roundup RT 12 oz/A plus 50 ml/gal liq. Am Sul + 18 ml/gal A-90 + Banvel @ 6 oz/A. 5 gal/A rate.(going to 1996 wheat)-Aug.11,95
13.27	-Spray w/Roundup RT 16 oz/A rate + LV6 @ 16 oz/A + 1# ai Aatrex 90df. 8 gpa rate. (going to 1996 fallow)
4.00	-Worked ground w/chisel-points & rod-weeder to level ground prior to seeding. - Sept. 26,95
8.16	-Sprayed w/Roundup RT @ 16 oz/A plus additives (4 gpA rate) - April 9,96
4.00	-Under-cut w/24" wide sweeps.
23.00	-Land Charges 1996
63.26	Total Cost of Summer Fallow

Rotation 1 SUMMARY 1996

Income		Expenses	
		67.77	Cost of Winter Wheat Crop
132.90	Sale of Winter Wheat	63.26	Cost of Fallow
132.90	Total Income	151.03	Total Cost of Production

-$9.07 Income per acre - 1996

Rotation 2

Winter Wheat / Sunflower / Millet

Cost / A.	1996 Winter Wheat
11.17	-Spray w/ 16 oz/A Roundup RT + additives + Banvel 4 oz/A 8 gpA rate. on Aug 31,95
27.39	-Plant to Nekota(90#/A rate)w/750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax Thiram RTU - Sept.27,95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer on dormant winter wheat at 60#N / Acre rate.- March 20,96
6.20	-Spray w/LV6 @ 8 oz product (6 oz ai)/acre plus 2 gal/A 32-0-0 8 gpa rate. - May 21,96
14.92	-Harvest 34.6 bu winter wheat - July 22,96 Test weight - 61.9# / bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
101.68	Total Cost of Winter Wheat Production

Rotation 2

WINTER WHEAT / *SUNFLOWER* / MILLET

Cost / A.	1996 Sunflowers
13.27	-Spray w/16 oz Roundup RT + additives + 16 oz LV6/acre. 8 gpA rate.
12.20	-Apply 1# ai TR-10 granules and under-cut w/24" sweeps - Oct.11,95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer added 60#N/Acre -Mar 20,96
4.00	-Disk to final incorporate TR:10 granules. - April 9,96
24.32	-Planted to Den Besten DB 697, at 18,000 seeds/A(2.7#/A) w/JD750 drill +6 gal/A 10-34-0. May 21,96
17.66	-Harvest 1063# / Acre Sunflowers - Oct.10,96 Test weight - 28.0# / bushel
.40	-Soil Sampling
23.00	- Land Charges 1996
113.45	Total Cost of Sunflower Production

Rotation 2

WINTER WHEAT / SUNFLOWER / *MILLET*

Cost / A	1996 Millet
6.23	-Spray w/Aatrex 90df @ 1# ai/A. 10 gpA spray rate. - Nov.8,95
14.70	-Spray 28-0-0 liquid Nitrogen fertilizer added 45#N/Acre.-Mar 20,96
8.48	-Spray w/12 oz Roundup Ultra + add + 2 oz Banvel/A.6 gpA rate.Jun 3,96
19.22	-Planted to Sunrise millet w/JD610 drill. w/ starter fertilizer(10-34-0) at 6 gal/Acre. Row spacing was at 10". Seeding rate was at 20#/A. - June 3,96
15.32	-Harvest 1829# Millet - August 27,96
.40	-Soil Sampling
23.00	-Land Charges 1996
87.35	Total Cost of Millet Production

Rotation 2 SUMMARY 1996

Income		Expenses	
153.28	Sale of Winter Wheat	101.68	Cost of Winter Wheat Crop
120.97	Sale of Sunflowers	113.45	Cost of Sunflower Crop
109.74	Sale of Millet	87.35	Cost of Millet Crop
383.99	Total Income	30248	Total Cost of Production

$27.17 Income per Acre - 1996

Rotation 3

WINTER WHEAT / SAFFLOWER / MILLET

Cost / A	1996 Winter Wheat
11.17	-Spray w/ 16 oz/A Roundup RT + additives + Banvel 4 oz/A 8 gpA rate. - Aug 31,95
27.39	-Plant to Nekota(90#/A rate)w/750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax Thiram RTU. - Sept.27,95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer on dormant winter wheat at 60#N / Acre rate. - March 20,96
6.20	-Spray w/LV6 @ 8 oz product (6 oz ai)/acre plus 2 gal/A 32-0-0 8 gpa rate. - May 21,96
14.40	-Harvest 32.0 bu winter wheat - July 22,96 Test weight - 63.3# / bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
101.16	Total Cost of Winter Wheat Production

Rotation 3

WINTER WHEAT / SAFFLOWER / MILLET

Cost / A	1996 Safflowers
13.27	-Spray w/16 oz Roundup RT + additives + 16 oz LV6/acre. 8 gpA rate.
12.20	-Apply 1# ai TR-10 granules and under-cut w/24" sweeps. - Oct.11,95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer added 60#N/Acre.-Mar 20,96
4.00	-Disk to final incorporate TR:10 granules. - April 9,96.
25.22	-Plant to S-541 w/JD 610 drill, 3-20" rows + 6 gpA 10-34-0. Seed treated w/ Vitavax 200. 20#/A seeding rate.
14.78	-Harvest 1366# / Acre Safflowers - Sept. 3,96 Test weight - 41.7# / bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
111.47	Total Cost of Safflower Production

Rotation 3

WINTER WHEAT / SAFFLOWER / MILLET

Cost / A.	1996 Millet
6.23	-Spray w/Aatrex 90df @ 1# ai/A. 10 gpA spray rate - Nov 8,95
14.70	-Spray 28-0-0 liquid Nitrogen fertilizer added 45#N/Acre.-Mar 20,96
8.48	-Spray w/12 oz Roundup Ultra + add.+ 2 oz Banvel/A.8 gpA rate. Jun 3,96
19.22	-Planted to Sunrise millet w/JD610 drill w/ starter fertilizer(10-34-0) at 6 gal/Acre. Row spacing was at 10". Seeding rate was at 20#/A. - June 3,96
16.00	-Harvest 1998# Millet - August 27,96
.40	-Soil Sampling
23.00	-Land Charges 1996
88.03	Total Cost of Millet Production

Rotation 3 SUMMARY 1996

Income		Expenses	
141.76	Sale of Winter Wheat	101.16	Cost of Winter Wheat Crop
183.46	Sale of Safflower	111.47	Cost of Safflower Crop
119.94	Sale of Millet	88.03	Cost of Millet Crop
445.16	Total Income	300.66	Total Cost of Production

$48.17 Income per acre - 1996

Rotation 4

WINTER WHEAT / MILLET

Cost / A	1996 Winter Wheat
11.17	-Spray w/ 16 oz/A Roundup RT + additives + Banvel 4 oz/A 8 gpA rate. - on Aug 31,95
27.39	-Plant to Nekota(90#/A rate)w/750 drill at 10" rows + 6 gal/A liquid 10-34-0 Seed treated w/5 oz/100 lbs Vitavax, Thiram, RTU - Sept.27,95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer on dormant winter wheat at 60#N / Acre rate. - March 20,96
6.20	-Spray w/LV6 @ 8 oz product (6 oz ai)/acre plus 2 gal/A 32-0-0 8 gpa rate. - May 21,96
13.38	-Harvest 26.9 bu winter wheat - July 22,96 Test weight - 62.3# / bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
100.14	Total Cost of Winter Wheat Production

Rotation 4

WINTER WHEAT / MILLET

Cost / A	1996 Millet
13.27	-Spray w/Roundup RT 16 oz/A rate + 16 oz/A LV6 + 1#ai Aatrex 90df 8 gpA spray rate. Aug 16,95
18.60	-Apply liquid nitrogen fertilizer(28-0-0) at 60#N/Acre - March 20,96
8.48	-Spray w/12 oz Roundup Ultra + add. + 2 oz Banvel/A.8 gpA rate.Jun 3,96
19.22	-Planted to Sunrise millet w/JD510 drill w/ starter fertilizer(10-34-0) at 6 gal/Acre. Row spacing was at 10". Seeding rate was at 20#/A. - June 3,96
16.25	-Harvest 2063# Millet - August 27,96
.40	-Soil Sampling
23.00	-Land Charges 1996
99.22	Total Cost of Millet Production

Rotation 4 SUMMARY 1996

Income		Expenses	
119.17	Sale of Winter Wheat	100.14	Cost of Winter Wheat Crop
123.78	Sale of Millet	99.22	Cost of Millet Crop
242.95	Total Income	199.36	Total Cost of Production

$21.80 Income per acre - 1996

Rotation 5

WINTER WHEAT / SUNFLOWER / SPRING WHEAT

Cost / A.	1996 Winter Wheat
10.83	-Spray w/ 54 oz Landmaster BW. 5 gpA rate.
27.39	-Plant to Nekota(90#/A rate)w/750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax, Thiram, RTU - Sept.27,95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer on dormant winter wheat at 60#N / Acre rate. - March 20,96
6.20	-Spray w/LV6 @ 8 oz product (6 oz ai)/acre plus 2 gal/A 32-0-0 8 gpa rate. - May 21,96
12.48	-Harvest 22.4 bu winter wheat - July 22,96 Test weight - 62.2# / bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
98.90	Total Cost of Winter Wheat Production

Rotation 5

WINTER WHEAT / *SUNFLOWER* / SPRING WHEAT

Cost / A.	1996 Sunflowers
13.27	-Spray w/16 oz Roundup RT + additives + 16 oz LV6/acre. 8 gpA rate.
12.20	-Apply 1# ai TR-10 granules and under-cut w/24" sweeps. - Oct.11,95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer added 60#N/Acre.-Mar 20,96
4.00	-Disk to final incorporate TR:10 granules. - April 9,96.
24.32	-Planted to Den Besten DB 697, at 18,000 seeds/'Aw/JD750 drill + 6 gal/A 10-34-0. - May 21,96
17.05	-Harvest 996# / Acre Sunflowers - Oct. 2,95 Test weight - 27.6# / bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
112.84	Total Cost of Sunflower Production

Rotation 5

WINTER WHEAT / SUNFLOWER / *SPRING WHEAT*

Cost / A.	1996 Spring Wheat
23.27	-Spray on 28-0-0 liquid nitrogen fertilizer at 80#N/A rate.- Mar.20,96
26.72	-Plant to Sharp HRS (90#/A rate)w/JD 750 drill+6 gal/A liquid 10-34-0. 10" row spacing. - Apr.3,95
11.49	-Spray w/ Dakota @ 1 pint / Acre + Banvel @ 2 oz/Acre 10 gpA rate on May 22,96
14.42	-Harvest 32.1 bu Spring wheat - July 22,96 Test weight - 62.6#/bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
99.30	Total Cost of Spring Wheat Production

Rotation 5 SUMMARY 1996

Income		Expenses	
99.23	Sale of Winter Wheat	98.90	Cost of Winter Wheat Crop
113.34	Sale of Sunflowers	112.84	Cost of Sunflower Crop
150.55	Sale of Spring Wheat	99.30	Cost of Spring Wheat Crop
363.12	Total Income	311.04	Total Cost of Production

$17.36 Income per acre - 1996

Rotation 6

WINTER WHEAT / SAFFLOWER / SPRING WHEAT

Cost / A.	1996 Winter Wheat
10.83	-Spray w/ 54 oz Landmaster BW. 5 gpA rate
27.39	-Plant to Nekota(90#/A rate)w/750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax, Thiram, RTU on Sept.27,95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer on dormant winter wheat at 60#N / Acre rate. - March 20,96
6.20	-Spray w/LV6 @ 8 oz product (6 oz ai)/acre plus 2 gal/A 32-0-0 8 gpa rate. - May 21,96
12.00	-Harvest 15.4 bu winter wheat - July 22,96 Test weight - 59.6# / bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
98.42	Total Cost of Winter Wheat Production

Rotation 6

WINTER WHEAT / SAFFLOWER / SPRING WHEAT

Cost / A.	1996 Safflowers
13.27	-Spray w/16 oz Roundup RT + additives + 16 oz LV6/acre. 8 gpA rate.
12.20	-Apply 1# ai TR-10 granules and under-cut w/24" sweeps. - Oct.11,95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer added 60#N/Acre - Mar 20,96
4.00	-Disk to final incorporate TR:10 granules. - April 9,96.
25.22	-Plant to S-541 w/JD 610 drill, 3-20" rows + 6 gpA 10-34-0. Seed treated w/ Vitavax 200. 20#/A seeding rate.
14.58	-Harvest 1316# / Acre Safflowers - Sept. 3,96 Test weight - 41.5# / bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
111.27	Total Cost of Safflower Production

Rotation 6

WINTER WHEAT / SAFFLOWER / SPRING WHEAT

Cost / A.	1996 Spring Wheat
23.80	-Spray on 28-0-0 liquid nitrogen fertilizer at 80#N/A rate - Mar.20,96
8.16	-Spray w/ 16 oz Roundup RT + additives - April 9,96
26.72	-Plant to Sharp HRS (90#/A rate)w/JD 750 drill+6 gal/A liquid 10-34-0. 10" row spacing. - Apr.3,95
11.49	-Spray w/ Dakota @ 1 pint / Acre + Banvel @ 2 oz/Acre 10 gpA rate. - May 22,96
14.42	-Harvest 34.0 bu Spring wheat - July 22,96 Test weight - 63.6#/bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
107.99	Total Cost of Spring Wheat Production

Rotation 6 SUMMARY 1996

Income		Expenses	
68.22	Sale of Winter Wheat	9842	Cost of Winter Wheat Crop
177.66	Sale of Safflower	111.27	Cost of Safflower Crop
158.46	Sale of Spring Wheat	107.99	Cost of Spring Wheat Crop
405.34	Total Income	31768	Total Cost of Prod.

$29.22 Income per acre - 1996

Rotation 7

WINTER WHEAT / CORN / FALLOW

Cost / A	1996 Winter Wheat
27.39	-Plant to Nekota(90#/A rate)w/750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax, Thiram, RTU on Sept.27,95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer on dormant winter wheat at 60#N / Acre rate - March 20,96
6.20	-Spray w/LV6 @ 8 oz product (6 oz ai)/acre plus 2 gal/A 32-0-0 8 gpa rate - May 21,96
15.46	-Harvest 37.3 bu winter wheat - July 22,96 Test weight - 61.1# / bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
91.05	Total Cost of Winter Wheat Production

Rotation 7

WINTER WHEAT / *CORN* / FALLOW

Cost / A	1996 Corn
12.36	-Spray wheat stubble w/ 2 1/2# ai Aatrex (90df) plus 1 qt crop oil 10 gpA rate - Aug. 16,95
21.20	-Spray 28-0-0 liquid Nitrogen fertilizer at 70#N/A rate.-Mar 20,96
37.20	-Planted Corn at 20,000 seeds/A DK 401 (90 day), 13" seed spacing, 24" rows plus liquid Starter Fertilizer (10-34-0) at 6 gal/A rate - May 2,96
22.48	-Spray w/Accent at 2/3 oz/Acre plus crop oil at 64 oz per 100 gallons of waler (5.12 oz/Acre) + Banvel @ 3 oz/A to control pigeongrass and broad-leaf weeds. 8 gallons/acre spray rate June10,96
19.78	-Harvest 58.9 bu Corn / Acre - Oct.10,96 Test weight - 56.0# / bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
136.42	Total Cost of Corn Production

Rotation 7

WINTER WHEAT / CORN / *FALLOW*

Cost / A.	1996 Summer Fallow
11.22	-Spray w/12 oz/A Roundup RT + additives + 6 oz Banvel/A 8 gpa rate. -Aug.11,95
4.00	-worked ground w/ chisel points & rod weeder prior to seeding. -Sept. 26,95
4.00	-Under-cut w/24" wide sweeps. - May 22,96
4.00	-Work plots with chisel points & rod weeder - Sept. 10,96
23.00	-Land Charges 1996
46.22	Total Cost of Summer Fallow

Rotation 7 SUMMARY 1996

Income		Expenses	
		91.05	Cost of Winter Wheat Crop
165.24	Sale of Winter Wheat	136.42	Cost of Corn Crop
147.25	Sale of Corn	46.22	Cost of Fallow
312.49	Total Income	273.69	Total Cost of Prod.

$12.93 Income per acre - 1996

Rotation 8

WINTER WHEAT / SUNFLOWER / CLOVER FALLOW

Cost / A	1996 Winter Wheat
25.57	-Plant to Nekota(75#/A rate)w/510 drill at 12" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax, thiram, RTU - Sept.26,95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer on dormant winter wheat at 60#N / Acre rate. - March 20,96
6.20	-Spray w/LV6 @ 8 oz product (6 oz ai)/acre plus 2 gal/A 32-0-0 8 gpa rate. - May 21,96
15.88	-Harvest 39.4 bu winter wheat - July 22,96 Test weight - 60.7# / bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
89.65	Total Cost of Winter Wheat Production

Rotation 8

WINTER WHEAT / *SUNFLOWER* / CLOVER FALLOW

Cost / A.	1996 Sunflowers
13.27	-Spray w/16 oz Roundup RT + additives + 16 oz LV6/acre. 8 gpA rate.
12.20	-Apply 1# ai TR-10 granules and under-cut w/24" sweeps. - Oct.11, 95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer added 60#N/Acre.-Mar 20, 96
4.00	-Disk to final incorporate TR:10 granules. - April 9,96.
24.32	-Planted to Den Besten DB 697, at 18,000 seeds/A w/JD750 drill + 6 gal/A 10-34-0. - May 21, 96
19.82	-Harvest 843# / Acre Sunflowers - Oct.10, 96 Test weight - 28.5#/ bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
115.61	Total Cost of Sunflower Production

Rotation 8

WINTER WHEAT / SUNFLOWER / *CLOVER FALLOW*

Cost / A.	1996 Clover Fallow
11.22	-Spray w/12 oz/A Roundup RT + additives + 6 oz Banvel/A 8 gpa rate. - Aug.11, 95
4.00	-worked ground w/ chisel points & rodweeder prior to seeding.-Sept. 26, 95
7.24	-Spray w/ Roundup Ultra 12 oz/A + AmSul. 8 gpA- May 21, 96.
6.50	-Broadcast on yellow sweetclover at 10# / acre rate - July 2, 96.
23.00	-Land Charges 1996
51.96	Total Cost of Summer Fallow

Rotation 8 SUMMARY 1996

Income		Expenses	
		89.65	Cost of Winter Wheat Crop
174.54	Sale of Winter Wheat	115.61	Cost of Sunflower Crop
95.93	Sale of Sunflowers	51.96	Cost of Clover Fallow
270.47	Total Income	257.22	Total Cost of Production

$ 4.42 Income per acre - 1996

Rotation 9

WINTER WHEAT / SAFFLOWER / CLOVER FALLOW

Cost / A.	1996 Winter Wheat
25.57	-Plant to Nekota(75#/A rate)w/610 drill at 12" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax, thiram, RTU on Sept.26,95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer on dormant winter wheat at 60#N / Acre rate. - March 20,96
6.20	-Spray w/LV6 @ 8 oz product (6 oz ai)/acre plus 2 gal/A 32-0-0 8 gpa rate. - May 21,96
14.60	-Harvest 33.0 bu winter wheat - July 22,96 Test weight - 60.8# / bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
88.37	Total Cost of Winter Wheat Production

Rotation 9

WINTER WHEAT / **SAFFLOWER** / CLOVER FALLOW

Cost / A.	1996 Safflowers
13.27	-Spray w/16 oz Roundup RT+ additives + 16 oz LV6/acre. 8 gpA rate.
12.20	-Apply 1# ai TR-10 granules and under-cut w/24" sweeps. - Oct.11,95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer added 60#N/Acre.-Mar 20,96
4.00	-Disk to final incorporate TR:10 granules. - April 9,96.
25.22	-Plant to S-541 w/JD 610 drill, 3-20" rows + 6 gpA 10-34-0. Seed treated w/ Vitavax 200 20#/A seeding rate. - April 10,96
14.57	-Harvest 1313# / Acre Safflowers - Sept 3,96 Test weight - 42.5# / bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
111.26	Total Cost of Safflower Production

Rotation 9

WINTER WHEAT / SAFFLOWER / **CLOVER FALLOW**

Cost / A	1996 Clover Fallow
11.22	-Spray w/12 oz/A Roundup RT+ additives + 6 oz Banvel/A 8 gpa rate. -Aug.11, 95
4.00	-worked ground w/ chisel points & rodweeder prior to seeding. - Sept. 26, 95
7.24	-Spray w/ Roundup Ultra 12 oz/A + AmSul. 8 gpA - May 21, 96.
6.50	-Broadcast on yellow sweetclover at 10# / acre rate - July 2, 96.
23.00	-Land Charges 1996
51.96	Total Cost of Summer Fallow

Rotation 9 SUMMARY 1996

Income		Expenses	
		88.37	Cost of Winter Wheat Crop
146.19	Sale of Winter Wheat	111.26	Cost of Safflower Crop
177.26	Sale of Safflowers	51.96	Cost of Clover Fallow
323.45	Total Income	251.59	Total Cost of Production

$23.95 Income per acre - 1996

Rotation 10

WINTER WHEAT / FIELD PEAS / MILLET

Cost / A	1996 Winter Wheat
11.17	-Spray w/ 16 oz/A Roundup RT + additives + Banvel 4 oz/A 8 gpA rate on Aug 31, 95
27.39	-Plant to Nekota(90#/A rate)w/750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax Thiram RTU on Sept.27, 95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer on dormant winter wheat at 60#N / Acre rate. - March 20, 96
6.20	-Spray w/LV6 @ 8 oz product (6 oz ai)/acre plus 2 gal/A 32-0-0 8 gpa rate. - May 21, 96
14.00	-Harvest 30.1 bu winter wheat - July 22, 96 Testweight - 62.3#/ bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
100.76	Total Cost of Winter Wheat Production

Rotation 10

WINTER WHEAT / FIELD PEAS / MILLET

Cost / A	1996 Field Peas
13.27	-Spray w/16 oz Roundup RT+ additives + 16 oz LV6/acre 8 gpA rate on Aug. 16, 95
8.15	-Spray w/16 oz Roundup RT + additives 4 gpA rate on April 9, 96.
29.59	-Plant to Arvika forage peas 95#/A + Innoculum ($ 71/acre) + 6 gpA 10-34-0, Seeded w/ JD 750 drill with 10" rows
12.30	-Harvest 1290 lbs / Acre peas or (21.5 bu/A) - July 25, 96 Test wt. 64.8 lbs/bu
.40	-Soil Sampling
23.00	-Land Charges 1996
86.71	Total Cost of Field Pea Production

Rotation 10

WINTER WHEAT / FIELD PEAS / MILLET

Cost / A.	1996 Millet
11.14	-Spray w/16 oz/A Roundup RT + AmSul + penetrate + 4 oz Banvel + 1# ai Aatrex 90df/A. Aug.31,95
18.60	-Apply liquid nitrogen fertilizer(28-0-0) at 60#N/Acre - March 20,96
8.48	-Spray w/12 oz Roundup Ultra + add.+ 2 oz Banvel/A.8 gpA rate.Jun 3,96
19.22	-Planted to Sunrise millet w/JD610 drill w/ starter fertilizer(10-34-0) at 6 gal/Acre. Row spacing was at 10". Seeding rate was at 20#/A. - June 3,96
17.06	-Harvest 2264# Millet / Acre - August 27,96
.40	-Soil Sampling
23.00	-Land Charges 1996
97.90	Total Cost of Millet Production

Rotation 10 SUMMARY 1996

Income		Expenses	
133.34	Sale of Winter Wheat	100.76	Cost of Winter Wheat Crop
86.00	Sale of Field Peas	86.71	Cost of Field Pea Crop
135.96	Sale of Millet	97.90	Cost of Millet Crop
355.30	Total Income	285.37	Total Cost of Production

$ 23.30 Income per acre - 1996

Rotation 11

WINTER WHEAT / CORN / MILLET

Cost / A.	1996 Winter Wheat
11.17	-Spray w/16 oz/A Roundup RT + additives + 4 oz Banvel/A 6 gpa rate. -Aug.31, 95
27.39	-Plant to Nekota(90#/A rate)w/750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax, Thiram, RTU on Sept.27, 95
18.60	-Spray 28-0-0 liquid Nitrogen fertilizer on dormant winter wheat at 60#N / Acre rate. - March 20, 96
6.20	-Spray w/LV6 @ 8 oz product (6 oz ai)/acre plus 2 gal/A 32-0-0 8 gpa rate. - May 21, 96
15.16	-Harvest 35.8 bu winter wheat - July 22, 96 Test weight - 62.4# / bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
101.92	Total Cost of Winter Wheat Production

Rotation 11

WINTER WHEAT / *CORN* / MILLET

Cost / A.	1996 Corn
12.36	-Spray wheat stubble w/ 2 1/2# ai Aatrex (90df) plus 1 qt crop oil 10 gpA rate. - Aug. 16,95
19.50	-Spray 28-0-0 liquid Nitrogen fertilizer at 75#N/A rate.-Mar 20,96
37.20	-Planted Corn at 20,000 seeds/A DK 401 (90 day), 13" seed spacing, 24" rows plus liquid Starter Fertilizer (10-34-0) at 6 gal/A rate - May 2,96
22.48	-Spray w/Accent at 2/3 oz per Acre plus crop oil at 64 oz per 100 gallons of water (5.12 oz/Acre) + Banvel @ 3 oz/A to control pigeongrass and broad-leaf weeds. 8 gallons/acre spray rate. June 10,96
18.82	-Harvest 54.1 bu Corn / Acre - Oct 10,96 Test weight - 56.0# / bushel
.40	-Soil Sampling
23.00	-Land Charges 1996
133.76	Total Cost of Corn Production

Rotation 11

WINTER WHEAT / CORN / *MILLET*

Cost / A.	1996 Millet
18.60	-Apply liquid nitrogen fertilizer(28-0-0) at 60#N/Acre - March 20,96
8.48	-Spray w/12 oz Roundup Ultra + add + 2 oz Banvel/A.8 gpA rate.Jun 3,96
19.22	-Planted to Sunrise millet w/JD610 drill. w/ starter fertilizer(10-34-0) at 6 gal/Acre. Row spacing was at 10". Seeding rate was at 20#/A. - June 3,96
15.68	-Harvest 1920# Millet - August 27,96
.40	-Soil Sampling
23.00	-Land Charges 1996
85.38	Total Cost of Millet Production

Rotation 11 SUMMARY 1996

Income		Expenses	
158.59	Sale of Winter Wheat	101.92	Cost of Wheat Crop
135.25	Sale of Corn	133.76	Cost of Corn Crop
115.20	Sale of Millet	85.38	Cost of Millet Crop
409.04	Total Income	321.06	Total Cost of Prod.

$29.33 Income per acre - 1996

Wall Rotation (On-site) Rain-Fall Data (1996)

Total Precip.(inches)		Total Precip.(inches)	
April	.75	August	1.72
May	5.53	September	2.41
June	80	October	.41
July	1.60	November	1.73

(Accumulative total precipitation from Apr.10 to Nov.30 is 14.95")

Cost of Inputs - 1996

SEED

Nekota Winter Wheat....$6.50/Bu
Sharp Spring Wheat..... 7.00/Bu
Sunrise Millet..... .15/#
Arvika Field Peas..... 8.00/Bu(60#)
DK 401 Corn..... 83.90/Bu(80,000 kernels)
Den Besten DB 697.... 75.00/25#
S-541 Safflowers..... 22.50/50#
Sweetclover..... .40/#

LIQUID FERTILIZERS

10-34-0..... $235/Ton ($1.37/gal)
28-0-0..... 145/Ton ($.78/gal)
32-0-0..... 179/Ton ($1.00/gal)

HERBICIDES

(From Warne Chem. Nov.14, 96)
Roundup RT.....$37.20/ga
Roundup Ultra..... 40.41/gal
X-77 (Surfactant)..... 16.50/gal
Ammonium Sulfate..... 4.22/gal
Atrazine 90df..... 2.91/lb
Crop Oil..... 4.50/gal
Buctril..... 56.75/gal
Accent..... 26.40/oz
Ally..... 21.13/oz
Treflan 10% granules.. .82/lb
LV6 (2,4D Ester)..... 19.58/gal
Banvel..... 78.93/gal
Bronate..... 47.85/gal
Poast..... 102.60/gal
Fallow Master..... 15.00/gal
Dakota..... 58.07/gal
Landmaster BW..... 18.62/gal

INSECTICIDES

Lorsban 4E..... 51.25/gal

NO-TILL PLANTING CHARGES

$8.00/Acre

LAND CHARGES

$23.00/Acre

SPRAY APPLICATION FEE

$3.00/Acre

HARVEST CHARGES

Base is $12/'A @ 20 bushels.
$.20/Bu for yields above 20 bushels

GRAIN SALE VALUES

(Hi + Low/2 from July 15-Nov 1,96 at Dakota Mill & Grain,Rapid City)
Winter Wheat-11.6% pro..$4.43/bu
Spring Wheat-12% pro..... 4.69/bu
Corn #2 yellow..... 2.50/bu
Proso Millet..... 6.00/cwt
Field Peas.(feed)..... 4.00/bu
Sunflowers (oil-type)..... 11.38/cwt
Safflowers (oil-type)..... 13.50/cwt

SOIL SAMPLING & ANALYSIS

$.40 / Acre

SEED TREATMENTS

Vitavax/Thiram/RTU..... $33.41/gal (5 oz/100# seed)
Seed treatment fee..... $ .25/Acre
Field Pea innoculum.(peat base)..$ .45/bu

MECHANICAL TILLAGE CHARGE

$4.00/Acre

Alternative Crop Strips at the Wall Rotation In 1996

The following crops were planted on experimental basis next to the Wall Rotation Study to analyze economic and agronomic potential for western South Dakota. Test plots were 25 feet wide by 100 feet long. They are as follows:

Foxtail Dahlia

Foxtail Dahlia, a native legume from South Dakota; was seeded at 6 lb/Acre plus 6 gallons 10-34-0 with a JD750 drill on April 9,96. The seed coat is very hard so it was scarified prior to planting. Stands were very poor. Foxtail dahlia is typically used in wild-life areas for a forage and for protective cover.

Coriander

Coriander, a herb; was planted at 18 lb/Acre + 6 gal 10-34-0 on April 9,96 with a JD 750 drill. Harvest was on July 25,96. Yields were at 350# per acre. Test weight was at 23.8#/bushel. Coriander was harvested for seed on July 25,96.

Westar Canola

Canola, an oil-seed; was planted at 6 lb/Acre + 6 gal/Acre 10-34-0 on April 9,96 with a JD750 drill. Canola responds best to cool growing and flowering conditions. Seed yields are extremely variable (75-650 lbs/acre) depending on temperatures at heading time.

Black Medic

Black Medic, a perennial legume; is used as a green fallow crop. It was planted in April of 1995. The plot was sprayed on June 3,96 w/1.5 pints/A Poast (grassy weed control) + 15 ml/gal of penetrate.

Yellow Lentils

Yellow lentils, a legume; are a human edible grain used in soups. They were planted at 58#/acre w/JD750 drill + 6 gal/A 10-34-0 on April 9,96. They were sprayed on June 3,96 w/1.5 pints/acre Poast + 15 ml penetrate. Yields were at 700# per acre at harvest on July 31,96. Test weight was at 63.2 #/bushel.

Black Lentils

Black lentils, a legume; are used as a livestock feed. They were planted at 25#/acre w/JD750 drill + 6 gal/A 10-34-0 on April 9,96. They were sprayed on June 3,96 w/1.5 pints/acre Poast + 15 ml penetrate. Yields were at 598# per acre at harvest on July 31,96. Test weight was at 65.3 #/bushel.

Arvika Pea/Jerry Oats

Arvika peas/Jeny oats (100# peas/acre,72# oats/acre) were planted with a JD 750 drill + 6 gal/A 10-34-0 on April 9,96. This forage combination has shown to be quite effective at canopying out weeds and has produced abundant amounts of forage. The down side is that if weeds become a problem, there are no herbicides that can be effectively used. Grain yields were at 1118# per acre at harvest time on July 25,96. Test weight of the combined grains were at 46.1 #/bushel. The grain in this mix was 45% peas and 55% oats. The pea portion weighed 60.6#/bu and the oats weighed 38.1#/bu.

Austrian Winter Peas

Austrian winter peas are used as livestock feed and fill a niche market as pigeon feed because of the small seed diameter. They were planted at 112#/acre + 6 gal/A 10-34-0 with a JD 750 drill on April 9,96. They were sprayed w/Poast at 1.5 pints/acre on June 3,96. Yields were at 1120# per acre at harvest time on July 25,96. Test weight was at 64.9 #/bushel.

Conversion of CRP to Cropland

Objectives: To evaluate tillage methods to convert CRP to Cropland.

Cooperator: Dave Finneman of Rapid City, SD

Procedure: The land used in this study was in CRP and a special release was obtained to conduct research on this land. The soil was a Nun clay loam located near the Rapid city airport. The species present in the CRP were bluegrass, western wheatgrass,sideoats grama and winter annuals like downy brome and penny-cress. The CRP experimental area was 400 foot by 800 foot and each plot was 90 X 200 foot. The experiment area was mowed with a rotary mower April 1, 1994.

The conventionally tilled plots were disked two times on April 15, 1994. The regrowth of grass and weeds on the no-till and min-till plots was sprayed May 16, with 32 ounces per acre of Roundup, 12 ounces LV6, ester of 2,4-D, and ammonium sulfate. The area was sprayed a second time June 15, with 24 ounces per acre Roundup, 16 ounces/A 2,4-D amine plus additives. The minimum tillage plots and the conventional tillage plots were worked with 24 inch wide sweeps on June 30, 1994. The no-tillage fallow and millet plots were sprayed again September 20, 1994 with 1 quart per acre of paraquat. The minimum tillage and conventional tillage plots were worked with a tandem disk to prepare a seed bed on September 1, 1994.

The plots were seeded to Arapahoe winter wheat on September 25, 1994. The no-till and minimum tillage plots were seeded with a JD750 no-till drill. The conventional tilled plots were seeded with a furrow type drill. All plots had a good stand of winter wheat in the fall of 1994. The no-till and minimum tillage plots had more downy brome-grass present than the conventionally tilled plots. The downy brome-grass was present in all plots. The experimental area was sprayed for broadleaf weeds during the spring of 1995. All plots were harvested for yield on August 7, 1995. The yield data is presented in Table 28.

TABLE 28

ARAPAHOE WINTER WHEAT CROP OF 1995

Production Method	Plot YIELD(BUSHELS / ACRE) Rep I	Rep II	Rep III	Rep IV	Average Bushels/acre
No-Till	28.2	28.2	27.3	25.9	27.4
Conventional Tillage	31.4	48.5	53.0	44.8	44.4
Minimum Tillage	35.7	26.7	27.3	31.6	30.3
No-Till Millet	38.9	34.4	N/A	31.6	35.0

Discussion on wheat crop of 1995: The cool season grasses were easily control with the two Roundup applications. However, the Roundup was not effective in controlling the warm season side-oats grama in the no-till plots. The combination of tillage and Roundup appeared to be effective in controlling all species. The min-till and no-till plots had more downy bromegrass present in the fall after planting and during the growing season. The competition from these two grasses reduced the winter wheat yields. Therefore, it will be important for producers to determine the species of grasses in the CRP prior to attempting the no-till conversion to cropland. The 1994 millet crop was not harvested due to dry weather and poor yields.

Procedure For The 1996 Safflower Crop: After harvest of the winter wheat crop in July 1995, the various blocks were prepared for safflower in 1996. The entire study was sprayed with 16 ounces per acre of Roundup RT + additives on October 10,95. Treflan TR:10 granules were applied and incorporated with 24 inch wide sweeps to the left 2 of 4 conventional plots on October 16,95 at 1# ai/Acre. The right half of the conventional plots was not tilled in the fall or spring. The idea was to evaluate the effects of using tillage to convert the CRP and then moving to no-till crop production.

Safflower was planted at 25#/A on April 26,96. A JD610 double-notched drill was used to plant the safflower in 20" rows and starter fertilizer (10-34-0) was applied at 6.5 gallons/Acre. The entire trial was sprayed with 16 oz of Roundup RT w/additives in 7 gallons/acre of 28-0-0 liquid nitrogen fertilizer (21#N/acre) on May 1,96 prior to the emergence of safflower. The entire trial was sprayed on June 17,96 with .1 oz Ally (broad-leaf weeds) and Poast Plus at 2 1/4 pints (cheatgrass control) + 2 pints crop oil at 10 GPA spray rate. The safflower was harvested on October 9,96. Yield data is presented in Table 29.

Results:

TABLE 29

Safflower Crop of 1996

Production Method	Average TW Pounds/Bu	Plot YIELD(Pounds / ACRE) Rep I	Rep II	Rep III	Rep IV	Average yield Pounds/Acre
Conventional/ Conventional	39.6	1293	1311	1037	1359	1250
Conventional/ No-till	38.7	1330	1149	1154	878	1128
Min-till/ No-till	38.5	846	1225	1285	1057	1103
No-till millet/ No-till	38.6	880	676	775	875	802
No-till/ No-till	39.2	590	514	1062	535	675

Summary of CRP Conversion: The conversion of CRP to cropland is a topic that many producers would like to have more information on. There are benefits to the soil structure and physical condition that have accumulated over the past ten years that we do not want to destroy. Research has indicated that 10 years of CRP however is not long enough to reproduce all the benefits of thousands of years of grass had. Because of the vegetative cover obtained by not cropping, haying or grazing CRP stopped soil erosion. When the land is brought back into crop production this can change and it is everyone's concern that the land not be subjected to extensive erosion.

The study was established in the spring of 1994 to evaluate no-till and conventional methods of converting CRP to cropland. The procedure describes the operations used for each treatment during the summer of 1994 when the plots were summer fallowed. The results were that we had very poor control of the warm season grass side-oats grama with herbicides only, however, the combination of herbicides and tillage did an excellent job of controlling the warm season and cool season grass. The plots were planted to winter wheat in the fall of 1994 and the wheat was harvested in the summer of 1995. The wheat yields are expressed in Table 28. The plots all had an excellent stand of winter wheat in the fall of 1994. The plots that were no-till and minimum till had more downy brome in the fall and spring. The significant reduction in yield on the no-till and minimum tillage plots was due to the increase in downy brome in those plots and possibly a reduction of plant available nitrogen. The plots that received conventional tillage would have had a much greater decomposition of organic matter during the fallow season.

The plots were seeded to safflower, a deep rooted warm season crop that should have been able to make use of any sub-soil moisture. The conventionally tilled plots from 1994 were split in half with one half being planted by conventional tillage (treatment 1) and the other half being planted by no-tillage methods (treatment 2). The first three treatments had some form of tillage in the process of converting to cropland. These three treatnments also had significantly higher yields. The treatments that had no tillage in the conversion process still have side-oats grama present in the plots. The warm season grass competed with the safflower crop for moisture during the late summer when it was very dry. All annual weeds were controlled by herbicides and so the yield differences were due to the warm season grass competition. Additional soil measurements were taken to determine the effects of the tillage during 1994 on the water infiltration rates and other physical properties. This data is not available at the time of this publication.

MON 37500 Tank Mix Compatability in Winter Wheat

Cooperator: Tim Komes of Sturgis, SD

Objectives: To evaluate tank mix compatability of MON37532 with other herbicides for Downy Bromegrass control in growing winter wheat.

Procedure: This trial was sprayed on April 23, 96 between 1-3 pm. A Suzuki ATV was used with a 10 foot boom. 8002 nozzles were used at a speed of 3.5 mph and at 30 psi (10 gpA spray rate). Winds were calm. Downy Brome was fully tillered (5-6/plant) and 15 leaves per plant. Wild buckwheat, mustard and pigweed were small with cotyledons to just emergence. Soil temp was at 64°F and air was at 68° F. The soil surface was dry but 1 inch below the soil was moist. Chlorosis notes were taken on April 29, 96. Height and percent control ratings of the downy bromegrass were taken on May 30, 96.

Results:

TABLE 30

				DOWNY BROMEGRASS		
				as of 4-29	as of 5-30	as of 5-30
Treatment	Oz prod /Acre	Timing of Application	Date of Spraying	Chlorosis % leaf	Height inches	Percent control
MON37532	.49	Post	April 23	1.0	5.0	56.3
MON37532	.66	Post	April 23	1.0	4.0	77.5
MON37532 2,4-D es	.49 8.0	Post	April 23	20.0	5.0	65.0
MON37532 2,4-D es	.66 8.0	Post	April 23	17.5	3.5	73.8
MON37532 2,4-D am	.49 12.0	Post	April 23	10.0	4.5	57.5
MON37532 2,4-D am	.66 12.0	Post	April 23	10.0	3.8	73.8
MON 37532 Banvel	.49 4.0	Post	April 23	20.0	4.5	56.3
MON37532 Banvel	.66 4.0	Post	April 23	20.0	4.3	68.8
MON37532 Bronate	.49 16.0	Post	April 23	12.5	3.8	70.0
MON37532 Bronate	.66 16.0	Post	April 23	10.0	4.3	73.8

Table 30 continued on next page

TABLE 30 continued

				DOWNY BROMEGRASS		
				as of 4-29	as of 5-30	as of 5-30
Treatment	Oz prod /Acre	Timing of Application	Date of Spraying	Chlorosis % leaf	Height inches	Percent control
MON37532	.49	Post	April 23	10.0	3.8	78.8
Buctril	16.0					
MON37532	.66	Post	April 23	12.5	3.0	85.0
Buctril	16.0					
MON37532	.49	Post	April 23	17.5	3.8	76.3
MCPA ester	8.0					
MON37532	.66	Post	April 23	15.0	3.0	82.5
MCPA ester	8.0					
MON37532	.49	Post	April 23	12.5	3.5	78.8
Express	.32					
2,4-D es	8.0					
MON37532	.66	Post	April 23	15.0	3.5	71.3
Express	.32					
2,4-D es	8.0					
MON37532	.49	Post	April 23	12.5	2.5	77.5
Harmony Ex	.49					
2,4-D es	8.0					
MON37532	.66	Post	April 23	12.5	2.8	81.3
Harmony Ex	.49					
2,4-D es	8.0					
CONTROL	N/A	N/A	N/A	1.0	10.5	1.0
			LSD(0.05) =	5.2	1.4	13.7
			CV =	29.7	23.8	13.8

Discussion: Higher rates of MON37532 used alone or in conjunction with other herbicides was effective at controlling the downy bromegrass. All treatments appeared to slow growth (height) of the downy bromegrass as compared to the control. The percents of control were lower because the downy bromegrass was at an advanced growth stage when treatments were applied.

A severe hail storm on the evening of July 5, 96 destroyed this experiment so no yield or test weight measurements were taken. Results presented in Table 30.

Comparisons of Roundup Ultra and Touchdown Labeled Rates

Cooperator: Tim Komes of Sturgis, SD

Objectives: To evaluate Roundup Ultra and Touchdown with additives for control of Prickly lettuce and Downy bromegrass.

Procedure: This trial was sprayed on May 14,96. A Suzuki ATV was used with a 10 foot boom and 8002 XR nozzles at 30 psi (10 gpA spray rate). Wind was totally calm and clear sky. Leaves were moist early but were dry at spraying time. Downy brome was 12 - 4" tall and Prickly lettuce was in rosette stage. The winter wheat stubble was heavy. Soil temp was at 57.8°F and air was at 67.8°F.

Discussion: Use of either Roundup Ultra or Touchdown with a wetting agent and ammonium sulfate at the high rates were very effective at control of downy bromegrass. Lower than recommended rates were used in this experiment and the ammonium sulfate aided in the control at these lower rates.

Prickly lettuce control was much more variable. Use of Roundup Ultra with ammonium sulfate at the high rate was more effective on control of prickly lettuce as compared to Touchdown at the high rate.

Notes on the control plots taken on May 30,96 saw downy brome headed and a solid stand of prickly lettuce at 5 inches tall. Results are presented in Table 31.

Results:

TABLE 31

Treatment	Oz prod /Acre	Date of Spraying	Prickly lettuce % Control	Downy Brome % Control
CONTROL	N/A	N/A	1.0	1.0
Roundup Ultra	8.0	May 14	52.5	75.0
Roundup Ultra	16.0	May 14	82.5	97.0
Touchdown R-11 (.5%)	4.0	May 14	30.0	38.8
Touchdown R-11 (.5%)	5.3	May 14	30.0	48.8
Touchdown R-11 (.5%)	10.6	May 14	62.5	88.8
Roundup Ultra Am-Sul (1.0%)	8.0	May 14	73.8	98.0
Roundup Ultra Am-Sul (1.0%)	16.0	May 14	90.0	99.0
Touchdown R-11 (.5%) Am-Sul (1.0%)	4.0	May 14	41.3	76.3
Touchdown R-11 (.5%) Am-Sul (1.0%)	5.3	May 14	48.8	78.8
Touchdown R-11 (.5%) Am-Sul (1.0%)	10.6	May 14	61.3	98.0
LSD(0.05) =			11.9	10.2
CV =			15.8	9.7

Downy Bromegrass Control in Winter Wheat with MON37532

Cooperator: Jim Madsen of New Underwood, SD

Objectives: To evaluate varying rates of MON37532 and Finesse herbicides for Downy bromegrass control in various growth stages of winter wheat.

Procedure: MON37532 and Finesse herbicides were applied with a 4 wheel ATV sprayer using 8002 nozzles at a rate of 10 gallons/acre at 4 spraying dates. On Sept.21,95 (pre), wind was 2 to 2 mph at boom height. The trial was sprayed at 5 pm. Air temp was at 48°F and soil temp was at 58°F. No cheatgrass was emerged and 1/3 inch of rain was received 2 days earlier. Wheat was emerged in the 3rd and 4th range and was germinated in the 1st and 2nd replications. On Oct.20,95 (E.Pos), wind was calm, and the same spray rates were used. Downy bromegrass was just emerging (1 leaf or just breaking the surface). On Oct.28,95 (L.Pos), winds were calm and sky was clear. The same spray rates were utilized as were used on Pre and E.pos. Soil temp was at 40°F and air was at 52°F. Downy brome was at 1-2 leaf stage. Wheat was at 3 tillers and 7-8 leaves. The spring (spr) application was sprayed on April 22,96. It was sprayed at 5 gpA utilizing 8001XR nozzles at 30 psi and at 3.5 mph. Wind was from the south at 6-8 mph. Downy bromegrass was at 2-3 leaves. The winter wheat and downy bromegrass were thin stands.

Discussion: The results of this trial are shown in Table 32. Use of MON37532 at Pre or E.Pos was very effective at downy bromegrass control and did not reduce yields or test weights of the wheat. Spraying in the spring was too late to get adequate cheatgrass control. Finesse at Pre or E.Pos was damaging toward crop yield and had less control on downy bromegrass as compared to MON37532 sprayed in the fall.

Results:

TABLE 32

Treatment	Oz prod /Acre	Timing of Application	Date of Spraying	Stand %survival	Downy brome % Control	Test wt lbs/bu	Yield bu/A
MON37532	.34	Pre	Sept 21	68.8	87.5	59.0	50.2
MON37532	.50	Pre	Sept 21	65.0	91.3	58.7	49.4
MON37532	.66	Pre	Sept 21	66.3	93.5	58.9	48.8
Control	N/A	N/A	N/A	80.0	1.0	59.4	50.6
Finesse	.40	Pre	Sept 21	57.5	77.5	57.6	43.4
MON37532+S	.34	E.Pos	Oct 20	61.3	86.3	59.2	47.7
MON37532+S	.50	E.Pos	Oct 20	66.3	90.0	58.1	45.7
MON37532+S	.66	E.Pos	Oct 20	65.0	92.5	58.6	46.0
Finesse Lexone	.34 3.0	E.Pos E.Pos	Oct 20	51.3	92.5	57.5	43.9
MON37532+S	.34	L.Pos	Oct 28	65.0	92.5	59.4	49.2
MON37532+S	.50	L.Pos	Oct 28	65.0	92.5	59.1	45.3
MON37532+S	.66	L.Pos	Oct 28	53.8	93.8	58.2	44.8
MON37532+S	.34	Spr	Apr 22	71.3	78.8	59.9	50.2
MON37532+S	.50	Spr	Apr 22	80.0	77.5	59.7	48.7
MON37532+S	.66	Spr	Apr 22	80.0	88.8	59.7	49.3
		LSD(0.05) =		15.6	7.0	1.6	5.2
		CV =		16.3	5.9	1.9	7.6

S = Surfactant(R-11) used at .5% or 6.4 oz/A on a 10 gpA mix.

Downy Bromegrass Control in Winter Wheat with Frontier

Cooperator: Jim Madsen of New Underwood, SD

Objectives: To evaluate Frontier herbicide for Downy bromegrass control in growing winter wheat.

Procedure: This trial was sprayed on Sept.21,95 (E Pos) The winter wheat was emerged and the downy bromegrass was not emerged. A Suzuki ATV with a 10 foot boom was used. 8002XR nozzles at 30 psi and at 3.5 mph delivered 10 gpA spray rate. Wind was from the north at less than 5 mph. Air temp was at 48°F and soil temp was at 58°F at 5 pm. It rained a inch two days prior to spraying. Wheat was sprouted but not totally emerged on reps 1 & 2. Wheat was emerged and at 1 leaf stage on reps 3 & 4.

Results:

TABLE 33

Treatment	Oz prod /Acre	Date of Spraying	Test wt lbs/bu	Yield bu/A
Control	N/A	N/A	59.2	50.5
Frontier	4.3	Sept.21	58.2	46.0
Frontier	8.5	Sept.21	59.5	50.1
Frontier	12.8	Sept.21	59.1	50.7
Frontier	17.1	Sept.21	58.4	45.0
Amber	.75	Sept.21	58.8	48.2
Frontier Amber	4.3 .75	Sept.21	58.4	45.1
Frontier Amber	8.5 .75	Sept.21	58.5	48.2
Frontier Amber	12.8 .75	Sept.21	58.3	45.4
Frontier Amber	17.1 .75	Sept.21	58.2	42.6
LSD(0.05) =			1.2	6.1
CV =			1.4	8.9

Discussion: There were no weed ratings due to very little downy brome in the trial. The high rate of Frontier plus Amber reduced yields when applied at 1-2 leaf stage of growth. Test weights were not greatly effected by the various rates of herbicide in the trial. Test results shown in Table 33.

Downy Bromegrass Control in Winter Wheat with Frontier

Cooperator: Jim Madsen of New Underwood,SD

Objectives: To evaluate varying rates of Frontier and Sencor used singly and in combination for control of Downy bromegrass in late post-emerge stage of winter wheat.

Procedure: Frontier and Sencor herbicides were applied with a 4 wheel ATV sprayer using 8002XR nozzles at a rate of 10 gallons/acre. The rates of 0.25, 0.5, 0.75, and 1.0 active ingredient per acre were applied late post emergence (L POS)(2-5 leaf stage of growth) on November 7,95. Grain yields were taken on July 23,96. Test weights and Crop yields are expressed in Table 34.

Results:

TABLE 34

Treatment	Oz prod /Acre	Timing of Application	Date of Spraying	Test wt lbs/bu	Yield bu/A
Control	N/A	N/A	N/A	59.2	43.6
Frontier LQ	4.3	Fall	Nov.7	59.9	45.4
Frontier LQ	8.5	Fall	Nov.7	59.2	45.3
Frontier LQ	12.8	Fall	Nov.7	59.2	46.5
Frontier LQ	17.1	Fall	Nov.7	58.5	40.6
Sencor DF	5.3	Fall	Nov.7	59.1	47.2
Frontier LQ Sencor DF	4.3 5.3	Fall	Nov.7	59.1	44.5
Frontier LQ Sencor DF	8.5 5.3	Fall	Nov.7	59.6	44.5
Frontier LQ Sencor DF	12.8 5.3	Fall	Nov.7	59.3	48.9
Frontier LQ Sencor DF	17.1 5.3	Fall	Nov.7	59.1	46.1
	LSD(0.05) =			1.0	6.3
	CV =			1.2	9.6

Discussion: The experiment was designed to evaluate the control of downy brome in growing winter wheat with late fall application of Frontier herbicide. This would be a very nice treatment if it was effective, however the herbicide is not cleared for use on winter wheat. The stand of winter wheat was thin in the spring due to limited winter-kill and strong winds in the spring. However, the crop yields were average and test weights were very normal. This would indicate the herbicide treatment did not hurt the crop. Earlier application of this herbicide was also evaluated. The earlier application appeared to injure the wheat more and yields were slightly reduced. No weed ratings were performed due to lack of downy bromegrass.

Wild Buckwheat control In Winter Wheat

Cooperator: Gregg Krebsbach of New Underwood, SD

Objectives: To evaluate wild buckwheat control in growing winter wheat through use of various broad-leaf herbicides.

Procedure: This trial was sprayed on May 14,96. A Suzuki ATV with a 10 foot boom was utilized. 8002XR nozzles at 30 psi and at 3.5 mph delivered a spray volume of 10 gallons per acre. A non-ionic spreader was used at .25% of total spray volume on each of the herbicide treatments. Wild buckwheat was at cotyledon to 2 true leaf stage. The winter wheat had 6 tillers and was 6 inches tall. Soil temp was at 67.4°F and air temp was at 75°F.

Results:

TABLE 35

Treatment	Oz prod /Acre	Date of Spraying	Wild Buckwheat % Control	Test wt lbs/bu	Yield bu/A
Control	N/A	May 14	1.0	60.7	50.9
Peak	.50	May 14	76.3	59.9	55.7
Peak Banvel	.38 4.0	May 14	83.8	60.1	53.7
Peak Bronate	.38 12.0	May 14	96.8	60.2	52.5
Peak Buctril	.38 12.0	May 14	99.0	60.3	52.4
Peak 2,4-D am	.38 8.0	May 14	78.8	59.7	51.0
Peak Banvel 2,4-D am	.25 2.0 5.28	May 14	81.3	59.7	57.2
Peak Bronate	.25 12.0	May 14	99.0	59.6	56.5
Bronate	16.0	May 14	99.0	60.1	53.4
Ally 2,4-D LV6	.10 5.33	May 14	85.0	59.7	57.5
		LSD(0.05) =	5.1	1.4	5.8
		CV =	4.4	1.6	7.4

Discussion: Peak is a new herbicide cleared for use on wheat and grain sorghum. Peak in combination with bronate or buctril appeared to be very effective in controlling wild buckwheat. The yields were increased slightly when Peak was used in combination with other herbicides. Results in Table 35.

Weed Control In Winter Wheat

Cooperator: Gregg Krebsbach of New Underwood, SD

Objectives: To evaluate Wild buckwheat control and yield response of winter wheat when using various herbicides.

Procedure: This trial was sprayed on May 14,96. A Suzuki ATV with a 10 foot boom was used. 8002XR nozzles were used at 30 psi at 3.5 mph to achieve 10 gallons per acre. Wild buckwheat was at cotyledon to 2 true leaf stage. Winter wheat had 5-6 tillers and was 6 inches tall. Soil temp was at 67.4°F and air temp was at 75°F. Soil was moist. Wild buckwheat control notes were taken on May 29,96. The buckwheat had 4 leaves. Winter wheat was in early jointing stage.

Results:

TABLE 36

Treatment	Oz prod /Acre	Date of Spraying	Wild Buckwheat % Control	Test wt lbs/bu	Yield bu/A
Control	N/A	May 14	1.0	62.0	50.3
Amber	.279	May 14	85.0	61.4	54.4
Ally	.100	May 14	85.0	63.3	55.2
Bronate	16.0	May 14	99.0	60.5	53.9
Amber Bronate(4L)	.1748 12.0	May 14	99.0	58.6	54.2
Amber Banvel(4L) 2,4D LV6(6L)	.1748 2.00 5.28	May 14	90.0	61.5	56.4
Peak	.4996	May 14	86.3	63.2	58.9
Peak Bronate(4L)	.2498 12.0	May 14	99.0	62.4	55.8
Peak Banvel(4L) 2,4D LV6(6L)	.250 2.00 5.28	May 14	87.5	60.6	55.2
	LSD(0.05) =		4.7	3.9	3.8
	CV =		4.0	4.4	4.8

Discussion: All treatments were consistently effective in controlling wild buckwheat during the summer of 1996. Amber and Peak alone had a slightly lower weed control rating than the mixtures. However, yields and test weights were good for all treatments. The buckwheat was very thick at about 4 plants per square foot when the treatments were applied. The summer was dry later in the season and the wheat competed very well with the buckwheat. The results did show some yield increases. The plots that did not have good control of the buckwheat went to seed. Peak is a new herbicide that has been cleared for use on wheat and grain sorghum.

Control of Leaf Spotting Diseases in Spring Wheat

Cooperator: Dave Finneman of New Underwood, SD

Objectives: To determine if fungicide applications to spring wheat applied at growth stage 5 & growth stage 8 will increase grain yields.

Procedure: Spring wheat was sprayed with a Suzuki ATV with a side boom delivering 28 gallons/Acre of spray volume. TK-SS2 flood-jet nozzles were used at 20 psi at a speed of 2 mph. Test plots were 15 feet wide by 50 feet long each. The trial was replicated 4 times in a randomized complete block design. GS-5 (fully tillered stage) was sprayed on June 10,96. Air temp was at 80 degrees F. Soil temp was at 80 degrees F. Air was calm. There were an average of 3 tillers per plant at the GS-5 stage. GS-8 (early flag-leaf stage) was sprayed on June 18,96. Air temp was at 80 degrees F. Soil temp was at 70 degrees F. Wind was from the north at 6-9 mph. The trial was harvested on August 12,96.

Results:

TABLE 37

Treatment	Oz prod /Acre	Timing of Application	Date of Spraying	Disease Rating* 1 - 5	Test wt lbs/bu	Yield bu/A
CONTROL[2]	N/A	N/A	N/A	4.3	57.9	44.8
CONTROL[3]	N/A	N/A	N/A	4.8	58.6	44.7
Tilt (split)	2.0	GS-5	June 10			
Penetrate	17.0					
(Same plots but 2 spraying dates)				2.3	58.7	44.2
Tilt (split)	2.0	GS-8	June 18			
Penetrate	17.0					
Tilt	4.0	GS-8	June 18	1.8	59.1	44.1
Penetrate	17.0					
Tilt 428C	4.0	GS-8	June 18	1.8	58.3	42.2
Penetrate	17.0					
		LSD(0.05)	=	.8	1.2	3.4
		CV	=	17.5	1.3	5.0

* = disease rating of tanspot & septoria taken on June 28,96. Rating of 1 is clean leaf, 5 is infested.

[2] & [3] = there were 2 controls evaluated at this trial.

Discussion: The plots had a heavy infestation of leaf spotting diseases early in the summer but by the time the flag leaf was emerging, the summer had turned dry. The leaf spotting disease rating on June 28 indicated infestations on the lower leaves but there was little infestation on the upper 2 leaves. The leaf spotting diseases did not infect the flag leaf and so the treatments were not effective in increasing crop yields. This is the normal weather pattern for western South Dakota during late June and early July. Results in Table 37.

1996-1997 PREVIEW

The following experiments are currently in process or soon will be. Data will be collected through the following year and presented in next years Annual Report.

No-Till Date of Planting Studies (2 locations)

These studies are designed to evaluate dates of planting and rates of seeding in no-till environments. The seven varieties are planted into millet stubble and no-till fallow

Cheatgrass control in Winter Wheat

These trials utilize varying rates and timing of MON37532 herbicide and/or other herbicides to control Cheatgrass in seedling winter wheat when applied in the fall or spring.

Grasshopper Control In Winter Wheat (2 locations)

A systemic insecticide (Gaucho), various rates of Orthene, and Furadan are being utilized on winter wheat seed to evaluate control of grasshoppers in the fall.

Methods of Converting CRP back to Crop Land

This trial was initiated in the spring of 1994. It looks at conversion of CRP (Crop Reserve Program) to cropland by use of Conventional, Minimum, and No-tillage methods. These plots were seeded to winter wheat in the fall of 1994. Winter wheat yields were taken in August of 1995. Safflower was grown on the wheat stubble in 1996. Agronomic differences and yields were evaluated on both crops. More CRP conversion techniques will be looked at in 1997.

SDSU Wheat and Oilseed Crop Rotation Study at Wall, SD

This 10 acre trial was initiated in the spring of 1994. There are 10 cropping sequences that are currently being evaluated. This rotation study looks at the economics, sustainability, and conservation compliance of wheat when grown in combination with minor oil seed crops (safflower, sunflower).

Variety Testing of Winter Wheat and Spring Grains (7 locations)

There are currently 5 CPT sites for evaluation of winter wheat. This year has 37 varieties of winter wheat at each location. There are trials at: Bison, Hayes, Wall, Oelrichs, and Martin. A reduced entry trial is at Newell and drill strips are at Bear Butte. Spring grains such as oats, barley, spring wheat, durum, and millet will have on-going evaluation at various test sites this spring.

Variety Testing of Oilseed and Specialty Crops

Safflower variety trials, field peas, garbanzo beans and other specialty crops will be evaluated throughout the 1997 growing season.